Misconduct in the banking industry: stock market reaction to settlement announcements

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ABSTRACT

This study investigates the impact of settlement announcements between international banks and regulators on the short-term stock market performance of the banks. Recurring to event study methodology, this analysis is focused in settlements larger than USD 100 million. The dataset is comprised of penalties imposed on 25 financial institutions indentified as Global Systemically Important Banks (G-SIBs), totaling 141 events from 2010 to February 2017. Results for the full sample show significant positive abnormal returns for different periods surrounding the event. Significant positive abnormal returns on the day before the announcement for non-USA banks suggest leakage of information before the information is made public. Regarding USA banks the market response, although positive, seems to be slightly delayed. The positive abnormal returns indicate that investors are pleased that litigation cases are concluded and that the terms of deals are better than expected. Partial tax deduction of financial penalties also contributes to the positive reaction. Analysis of the determinants of abnormal returns supports these arguments and reveals that investors penalize less efficient banks. Lastly, settlements involving payments with compensatory nature and violation of sanctions are particularly well received by the market and lead to larger abnormal returns.

ABSTRACT (portuguese version)

Este estudo investiga o impacto que a divulgação de *settlements* entre bancos internacionais e reguladores tem na performance a curto prazo das ações dos bancos em bolsa. Recorrendo à metodologia de *event studies*, esta análise foca-se em *settlements* superiores a USD 100 milhões. Os dados utilizados consistem em multas impostas a 25 instituições financeiras identificadas como *Global Systemically Important Banks* (*G-SIBs*), totalizando 141 eventos desde 2010 até fevereiro de 2017. Os resultados para a amostra total mostram retornos anormais positivos significantes para períodos diferentes em torno do evento. Retornos anormais positivos significantes no dia anterior à divulgação para bancos não americanos sugerem a existência de fuga de informação antes da mesma ser tornada pública. Em relação a bancos americanos, a reação do mercado, embora positiva, parece ocorrer com algum atraso. Os retornos anormais positivos indicam que os investidores ficam agradados com a conclusão de litígios e que os termos acordados são mais vantajosos do que o esperado. A dedução parcial das multas para fins de impostos também contribui para a reação positiva. A análise aos determinantes dos retornos anormais sustenta estes argumentos e revela que os investidores penalizam bancos menos eficientes. Por último, *settlements* que envolvam pagamentos de natureza compensatória e violação de sanções são particularmente bem recebidos pelo mercado e levam a retornos anormais maiores.

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1. Introduction

The main purpose of this study is to extend prior research on corporate misconduct in the financial sector, by examining stock market reaction after public disclosure of settlements (and correspondent financial penalties) between banks and regulators that result in the conclusion of unsolved litigation. Different phases during corporate ligation could trigger different short-term market reactions. Previous research has shown that allegations of corporate misconduct lead to significant declines in the equity value of firms, as investors anticipate potential losses arising from litigation and reputational costs. With ongoing litigation, uncertainty about the final outcome is always present. This uncertainty leads investors to fear additional litigation-related costs and new enforcement actions being brought up against the firm by regulators. In fact, the uncertainty only vanishes when the case ends, usually under the form of a settlement or judgment. At this stage, several factors might prompt a positive reaction from investors (e.g. final outcome is known and firms get off lightly).

Using event study methodology, I investigate whether the announcement of settlements with regulatory agencies (in some cases private entities) has a significant impact on the market value of Global Systemically Important Banks (G-SIBs). Assuming that markets are efficient in the sense that all publicly available information is reflected in stock prices, if settlement announcements convey unexpected information, investors should react and stock prices will be affected. If this is verified, settlement announcements are considered informative. Additionally, in order to understand in more detail and explain the results of the event study, I study the cross-sectional information content of settlement announcements by analyzing if certain bank-specific and settlement-specific variables influence investors' reaction upon the announcement of resolution of litigation.

The remainder of the study is organized as follows: Section 2 highlights the concepts behind misconduct and reputational risk. In Section 3 research related to this study is discussed. In Section 4 the methodology used throughout the study is provided. In Section 5 I describe the data used in the study and elaborate on how the dataset was created. Additionally, due to lack of research on this subject an overview of financial penalty trends is provided for banks in the sample. In Section 6 the empirical results are presented and analyzed. Lastly, Section 7 concludes.

2. Misconduct and reputational risk

Misconduct risk in banking has been growing consistently after the 2007-2009 global financial crisis because of stricter rules on financial intermediation and increased scrutiny by customers and regulators (Resti, 2017). Despite its harmful impact on both the financial stability of the banking sector and the real economy, misconduct risk does not have a single, precise definition. According to the European Banking Authority (EBA), misconduct risk is defined as "the current or prospective risk of losses to an institution arising from an inappropriate supply of financial services, including cases of willful or negligent misconduct" (European Banking Authority, 2016, p. 89).

Misconduct in banks may damage confidence in the financial system, which has been weakened since the emergence of the aforementioned financial crisis. Regulators and supervisors must ensure that banks are stable and safe, making the execution of enforcement actions an important tool that allows them to sanction banks whenever they violate safe banking practices or the law is broken. *Ex post* penalties in the form of fines are the most common determent method of regulators. They rely on the discouraging effect of a pecuniary fine, in addition to a reputational cost (Carletti, 2017). This is an important feature of banking supervision, since due to opaqueness of bank business models (Morgan, 2002), regulators must have clearer information than market participants.

While financial penalties rightly serve as a correcting mechanism, in certain cases, they may entail systemic risks and have a counterproductive effect for financial stability (European Systemic Risk Board, 2015). In fact, the European Banking Authority introduced in 2014, for the first time, costs related to misconduct risk in its EU-wide stress tests. Still, Köster and Pelster (2017) point out that for some commentators these litigation costs are just another cost of doing business. According to a report elaborated by The Boston Consulting Group (BCG), banks across the world have paid around USD 321 billion since 2009, and while U.S. regulators have been more effective in imposing penalties and recovering fines, their counterparts in Europe and Asia are likely to step up pace (The Boston Consulting Group, 2017).

Misconduct risk and reputational risk go hand in hand as reputational costs are usually a consequence of misconduct. Reputational risk is the "risk arising from negative perception on the part of customers, counterparties, shareholders, investors, debt-holders, market analysts, other

relevant parties or regulators that can adversely affect a bank's ability to maintain existing, or establish new, business relationships and continued access to sources of funding" (Bank for International Settlements, 2009, p. 19). In sum, reputational risk is any risk that can potentially damage the status of an organization in the eyes of third-parties. Reputational costs arise because of the weakened confidence of stakeholders, which can be manifested, for example, in lower sales by a firm that engages in consumer fraud or unfavorable changes in the terms of trade with suppliers when a firm cheats in its commercial transactions (Murphy et al., 2009).

3. Literature review

In an institutional context, a firm's choice to engage in erratic behaviors (i.e. misconduct) is the same as any other business decision (Simpson, 2002). Yet, the potential losses stemming from its detection should be weighed against the potential economic gains in case of impunity. According to Murphy et al. (2009) potential losses include costs resulting from litigation and reputational costs.

There is a considerable vast literature dealing with cross-industry firms accused of misconduct acts and the correspondent impact on the stock price. Karpoff and Lott (1993) were some of the first conducting research in this topic, and they analyze the market impact that firms experience after the initial press announcement that they are facing criminal charges. In a sample consisting of 132 corporate frauds from 1978 to 1987, the authors find that alleged or actual fraud announcements of stakeholders or the government correspond to significant losses in the accused firm's common stock market value, with average abnormal declines of 1.3% and 5.1% respectively. They also find that around 6.5% is explained by penalties and legal fees, with the remaining loss being explained by reputational damages. Other studies present similar results (Alexander, 1999; Bhagat et al., 1994; Murphy et al., 2009; Reichert et al., 1996 Skantz et al., 1990).

With respect to short-term returns, it is not surprising that the first public disclosure of a firm's misconduct should have a negative effect on the stock price, as shareholders anticipate the monetary losses that might emerge, such as financial penalties and legal costs, and also the resultant reputational damage (Haslem, 2005). Nonetheless, different events during corporate litigation could cause different reactions. The settlement or judgment is a crucial event in

corporate litigation, since only at this point the precise information about the extent of wrongful activities is publicly disclosed. Although it is likely that information about the misconduct has surfaced before the date of the settlement or judgment, there is uncertainty about its trustworthiness and whether if such information is definitive or not.

Köster and Pelster (2017) argue that upon a settlement or judgment a positive effect on the stock price is expected for several reasons. The resolution of litigation concludes a dispute, eliminates the uncertainty about the final outcome and puts an end to the costs arising from the negative media coverage of the process. A positive market reaction might also indicate that investors realize that firms get off lightly, as financial penalties might be small, when weighted against the realized gains accrued from the misbehavior or the provisions set aside. Additionally, the resolution of unsolved litigation and the correspondent financial penalties might also promote a change towards more elaborate governance mechanisms and contribute to more responsible practices by the management (Agrawal et al., 1999). In particular, settlements should be seen as good news for shareholders of the accused firms and as the optimal solution in litigation cases, because they reduce the risk of larger financial penalties when resolution is achieved through a judgment (Haslem, 2005).

Some authors have studied the short-term market reaction after settlement announcements but there is disparity among the results. Contrary to what would be expected, Haslem (2005) detects negative abnormal returns after a settlement is announced, and argues that self-interest prompts managers to settle at higher values even when it could be more benefic for shareholders not reaching a settlement. Other studies find a negative or insignificant effect of the settlement on stock prices (Karpoff and Lott, 1993, 1999). Conversely, Bhagat et al. (1994) and Koku and Qureshi (2006) find short-term positive abnormal returns.

When focusing only in the financial industry, the number of research investigating the impact of misconduct-related issues on the market value of banks is somewhat limited and scarcer than expected. Studies by Cummins et al. (2006), De Fontnouvelle and Perry (2005), and Gillet et al. (2010) analyze the reputational loss that financial companies experience after unexpected operational losses. De Fontnouvelle and Perry (2005) examine reputational damage following operational loss announcements for a sample of 115 worldwide listed banks from 1974 to 2004. The authors show that the announcement date has a significant, negative impact on the stock

price of the banks and that the reputational effect, measured by the difference of market value loss and the operational loss (relative to the market value), is larger when the operational loss is due to internal fraud. Cummins et al. (2006) perform a similar analysis for 403 listed USA banks and 89 listed USA insurance companies between 1978 and 2003, considering operational loss announcements larger than USD 10 million. They find that both types of firms experience significant negative price reactions with market value drops exceeding the amount of the operational losses. However, banks experience smaller negative impacts and the reputational effect is larger for high growth firms (measured by high Tobin Qs). Gillet et al. (2010) investigate the market reaction after the announcement of operational losses larger than USD 10 million for 152 financial companies listed in Europe and USA between 1990 and 2004. For each operational loss, key dates are defined and analyzed: the first press announcement, the recognition by the targeted company, and the settlement date. The authors discover significant negative abnormal returns around the first press date, while around the settlement date (when it differs from the two other dates) significant positive abnormal returns are detected. They also find that internal frauds trigger larger abnormal returns, and that USA financial companies suffer larger reputational losses than their European counterparts. Finally, Köster and Pelster (2017) examine the impact of financial penalties on banks' market value and profitability. Their sample is comprised of 68 financial institutions from 20 different countries and only settlements or judgments higher than USD 10 million are considered. The authors find significant positive abnormal returns in the period surrounding the announcement of the settlement or judgment, and also in the one-year buy-and-hold returns. The arguments used to explain such reaction are: 1) improvement of the managers' behavior and cessation of erratic behaviors after the payment of a fine; 2) investors' sense of relief due to the magnitude of the penalty (when weighted against the economic gain achieved through misconduct); 3) partial tax deductibility of some financial penalties, partly offsetting their negative impact in banks' results[1]; 4) elimination of uncertainty associated with pending litigation and cessation of negative media coverage.

[1] For example, USA tax law allows banks to deduct compensatory damages from the taxable income.

4. Methodology

4.1 Event study methodology synthesis

An event study measures the impact of a specific event on the value of a firm (Mackinlay, 1997). More specifically, using this method, one can determine whether there is an abnormal stock price effect associated with an unanticipated event – that is, if the returns were different from those that would be considered appropriate (or normal), given a certain model used to obtain theoretically adequate returns. Studies by Ball and Brown (1968) and Fama et al. (1969) introduced the standard methodology that continues to be used today. Since analyzing each event individually is not very informative, the key focus is to measure the sample securities' mean and cumulative mean abnormal returns around the time of an event (Khotari and Warner, 2006).

While there is not a single defined structure for conducting event studies, there is a general flow of analysis. Mackinlay (1997) summarizes the procedure in seven steps:

First, it is mandatory to define what constitutes the event of interest and the period over which the security prices of the firms involved will be analyzed. This period is known as the event window. The second step consists in determining the selection criteria for the inclusion of a given firm in the study. Third, it is required to define and calculate the normal and abnormal returns (ARs) for each individual event. Several models can be used to calculate the normal returns (e.g. Market Model, Fama-French three Factor Model). After selecting which model to generate normal returns, the estimation window needs to be defined. This is the period over which the parameters of the model are estimated. Typically, the estimation window precedes the event window, so that the event does not influence the normal performance model estimates. This is the fourth step. Then, abnormal and cumulative abnormal returns (CARs) can be calculated in the event window.

The fifth step is defining the testing framework for ARs and CARs. Important considerations are defining the null hypothesis and determining the techniques for aggregating the ARs. Several tests (parametric and non-parametric) can be used to access the statistical significance of ARs. However, the quality of test statistics is related to the characteristics of the data. Deviations of these characteristics from those required by statistical theory will worsen the quality of the test statistics. So, researchers must understand the statistical assumptions inherent to different tests and their limitations when hypothesis testing.

Common issues highlighted and examined by the literature are summarized by Binder (1998): 1) cross-sectional correlation (in event time) of abnormal returns estimators (particularly severe when all firms belong to the same industry or when there is event clustering; 2) heterogeneity of the abnormal return estimators variance; 3) serial correlation of abnormal return estimators for individual firms; 4) abnormal return estimators have greater variance during the event-period (also known as event-induced variance). While researchers must be aware of these specific characteristics, often many of the problems can simply be ignored, because, in practice, they are quite minor (Binder, 1998).

The sixth step is the presentation of empirical results, and the last step is interpretation of the results and conclusions obtained.

4.2 Defining events

Events are only considered when they have a final character, that is, when there is a settlement announcement. When there is more than one settlement on the same date for the same bank, penalties are added, constructing what I call *aggregate financial penalties*. Each aggregate financial penalty corresponds to one event and the minimum amount for inclusion is USD 100 million. In total, there are 195 individual financial penalties and 149 aggregate financial penalties. However, the number of events reduces to 141 due to the existence of concurring events.

4.3 Constructing abnormal returns

First, individual daily continuously compounded stock returns are calculated from closing prices (adjusted for capital events) retrieved from *Thomson Reuters Datastream* database. Each daily return is calculated from the previous day with a non-missing price and trading volume to the current day, using the following formula:

$$R_{it} = \ln\left(\frac{P_{it}}{P_{it-1}}\right) \tag{1}$$

where R_{it} is the daily continuously compounded return for stock i on day t, P_{it} is the adjusted closing price for stock i on day t, and P_{it-1} is the adjusted closing price for stock i on day $t-1$. ARs are the actual returns of securities over the event window minus the normal, or expected,

returns over the event window. The normal returns are defined as the expected returns if no event had taken place. For each sample security i, the abnormal return at time t relative to the event is:

$$AR_{it} = R_{it} - ER_{it} \tag{2}$$

where AR_{it} is the abnormal return, R_{it} is the actual return, and ER_{it} is the normal return (given by a particular model of expected returns).

To calculate the ARs for each event, as in previous studies, the market model is used. The market model is a statistical model that relates the return of a security to the return of the market portfolio, as expressed in the following equation:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{3}$$

where R_{it} is the stock return of the i^{th} bank on day t, R_{mt} is the return of a market index on day t, ε_{it} is the zero mean error term, β_i is a parameter that measures the sensitivity of R_{it} to the market index, and α_i is a parameter that represents the idiosyncratic risk component of bank i stock. The abnormal return of bank i stock on day t is estimated as the residual ε_{it}, and is defined as:

$$AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt}) \tag{4}$$

In addition to the market model, a two-index model is also used to generate the abnormal returns. In this model, besides the standard market factor, it is also included an industry factor. The MSCI *World Banks Index* is chosen to proxy for the banking industry. This index is composed of large and mid cap stocks across 23 developed markets countries[2]. All securities are classified in the Banks industry group according to the Global Industry Classification Standard (GICS). The model is expressed as follows:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \beta_{iIND} IND_t + \varepsilon_{it} \tag{5}$$

where R_{it} is the stock return of the i^{th} bank on day t, R_{mt} is the return of a market index on day t, IND_t is the return of the banking industry index on day t, ε_{it} is the zero mean error term, β_i is a

[2] Developed Markets countries include: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, U.K, and USA.

parameter that measures the sensitivity of R_{it} to the market index, β_{iIND} is a parameter that measures the sensitivity of R_{it} to the banking industry index, and α_i is a parameter that represents the idiosyncratic risk component of bank i stock. The abnormal return of bank i stock on day t is estimated as the residual ε_{it}, and is defined as:

$$AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt} + \beta_{iIND} IND_t) \quad (6)$$

Lastly, for robustness of results, the Carhart (1997) four-factor model is also used to generate abnormal returns. This model is an extension of the Fama-French (1993) three-factor model (Fama and French, 1993), and is defined as follows:

$$R_{it} = \alpha_i + \beta_{iM} R_{mt} + \beta_{iSMB} SMB_t + \beta_{iHML} HML_t + \beta_{iMOM} MOM_t + \varepsilon_{it} \quad (7)$$

where R_{it} is the stock excess return of the i^{th} bank on day t, R_{mt} is the return of a market index on day t, SMB_t is the average return on three small market capitalization portfolios minus the average return on three large market capitalization portfolios, HML_t is the average return on two high book-to-market equity portfolios minus the average return on two low book-to-market equity portfolios, MOM_t is the average return on two high prior return portfolios minus the average return on two low prior return portfolios, ε_{it} is the zero mean error term, β_{iM} is a parameter that measures the sensitivity of R_{it} to the market index, β_{iSMB} is a parameter that measures the sensitivity of R_{it} to the size factor, β_{iHML} is a parameter that measures the sensitivity of R_{it} to the value factor, β_{iMOM} is a parameter that measures the sensitivity of R_{it} to the momentum factor, and α_i is a parameter that represents the idiosyncratic risk component of bank i stock. The abnormal return of bank i stock on day t is estimated as the residual ε_{it}, and is defined as:

$$AR_{it} = R_{it} - (\alpha_i + \beta_{iM} R_{mt} + \beta_{iSMB} SMB_t + \beta_{iHML} HML_t + \beta_{iMOM} MOM_t) \quad (8)$$

The indexes and datasets used per country for each return generating model are shown in **Appendix 1**. The parameters in equations (3), (5) and (7) are estimated via Ordinary Least Squares (OLS) over a specific estimation window. While there is no consensus in the literature regarding the length that should be used, the use of daily rather than monthly return data has become more prevalent (Khotari and Warner, 2006). One year of daily observations is used, that

is, 250 trading days. To check if results are dependent on estimation window length, 200 and 150 trading days are also used (not reported). Considering $t = 0$ the event day, parameters are estimated for the following estimation windows: (-251, -2); (-201, -2); (-151, -2). Abnormal returns are calculated for each day of the (-1, 1) window. The chosen event window is short on purpose, since it only includes the day preceding the event, the event day and the day after the event. Nonetheless, it allows one to analyze possible leakage of significant information before the announcement, and the reaction in the trading day after if the information becomes public when markets are closed. With longer event windows the probability of existent concurrent events is higher, and this would result in the removal of more events from the analysis.

4.4 Common definitions

The estimation window length is $L_1 = T_1 - T_0 + 1$, with T_1as the latest day of the estimation window, and T_0 as the earliest day of the estimation window relative to the event day. The event window length is $L_2 = T_2 - T_1 + 1$, with T_2 as the latest day of the event window relative to the event day. The sample size is defined as N (i.e. number of events), and M_i refers to the number of non-missing returns in the estimation window of bank i.

Assuming that ARs are independent and identically distributed the equal-weighted average abnormal return (AAR) on a single-day period t for a sample of N events is calculated as:

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it} \tag{9}$$

The cumulative average abnormal return (CAAR) for multiple-day periods ($t1, t2$,) for a sample of N events is calculated as:

$$CAAR_{t1,t2} = \sum_{t=t1}^{t2} AAR_t \tag{10}$$

The variance of ARs for each bank i is estimated over the estimation window as:

$$\sigma^2{}_{AR_i} = \frac{1}{(M_i - p)}\sum_{t=T_0}^{T_1} \left(AR_{i,t}\right)^2 \tag{11}$$

where p is the number of parameters to estimate (2 if market model, 3 if two-index model and 5 if four-factor model).

4.5 Test statistics

The literature on event study test statistics is very rich, as is the range of significance tests. Usually, significance tests can be grouped into two separate groups: parametric and non-parametric tests. Parametric tests rely on assumptions about the distribution of ARs, as opposed to non-parametric tests which do not. To be certain that the results do not depend on a singular test, five parametric tests and two non-parametric tests will be used.

4.5.1 Ordinary t-test

The ordinary t-test is the standard parametric test statistic proposed by Mackinlay (1997). This method assumes that residuals are independent across events. It does not take into consideration cross-sectional correlation of residuals and the possibility of event-induced variance.

For single-day periods the test is asymptotically $N(0,1)$ distributed under the null hypothesis of no event effect, and is defined as:

$$t = \frac{AAR_t}{\left(\sigma^2{}_{AAR_t}\right)^{0.5}} \tag{12}$$

where $\sigma^2{}_{AAR_t}$ is the variance of AARs, estimated as:

$$\sigma^2{}_{AAR_t} = \frac{1}{N^2}\sum_{i=1}^{N}\sigma^2_{AR_i} \tag{13}$$

and $\sigma^2_{AR_i}$ is the variance of ARs, estimated for each firm i during the estimation window as in equation (11) .

For multiple-day periods the test is asymptotically $N(0,1)$ distributed under the null hypothesis of no event effect, and is defined as:

$$t = \frac{CAAR_{t1,t2}}{\left(\sigma^2{}_{CAAR_{t1,t2}}\right)^{0.5}} \tag{14}$$

where $\sigma^2{}_{CAAR_{t1,t2}}$ is the variance of CAARs, estimated as:

$$\sigma^2{}_{CAAR_{t1,t2}} = \sum_{t=t1}^{t2} \sigma^2{}_{AAR_t} \tag{15}$$

4.5.2 Crude dependence adjustment test

To account for cross-sectional correlation of abnormal returns, Brown and Warner (1980, 1985) suggest that firms should be grouped into a portfolio, and the time series (in event time) of average portfolio residuals over the estimation window is used to calculate the standard deviation of AARs. This parametric test uses a single variance estimate for the entire portfolio. As a result, it does not consider unequal return variances across securities.

For single-day periods the test is asymptotically $N(0,1)$ distributed under the null hypothesis of no event effect, and is defined as:

$$tCDA = \frac{AAR_t}{\sigma_{AAR}} \tag{16}$$

where σ_{AAR_t} is the standard deviation of the AARs, estimated as:

$$\sigma_{AAR} = \left[\frac{1}{(M-2)} \sum_{t=T_0}^{T_1} (AAR_t - \overline{AAR})^2 \right]^{0.5} \tag{17}$$

and $\overline{AAR}$ is estimated as:

$$\overline{AAR} = \frac{1}{M} \sum_{t=T_0}^{T_1} AAR_t \tag{18}$$

For multiple-day periods the test is asymptotically $N(0,1)$ distributed under the null hypothesis of no event effect, and is defined as:

$$tCDA = \frac{CAAR_t}{\sqrt{L_2}\sigma_{AAR}} \tag{19}$$

4.5.3 Patell test

In this parametric test, also known as "standardized residual test", suggested by Patell (1976), residuals are first estimated as in the ordinary t-test. However, before being aggregated over time and across events, they are standardized. This standardization adjusts for the fact that event-period residuals are out-of-sample predictions, thus having greater standard deviation than estimation-window residuals (Patell, 1976). Standardized values of residuals are obtained by dividing the event-period abnormal returns by the standard deviation of the estimation window, adjusted to reflect the forecast error (Boehmer et al., 1991). While this method assumes that residuals are cross-sectionally uncorrelated and that event-induced variance is insignificant, it allows for heteroskedasticity in event window residuals and helps prevent securities with large volatility from over-influencing the results. The adjustment in this test is only calculated for the market model residuals. For the other two models residuals are standardized by the square root of their variance, calculated as in equation (11).

The adjustment to the variance of ARs of each firm i is:

$$\sigma^2{}_{AR_{i,t}} = \sigma^2{}_{AR_i}\left[1 + \frac{1}{M_i} + \frac{\left(R_{m,t} - \bar{R}_m\right)^2}{\sum_{t=T_0}^{T1}\left(R_{m,t} - \bar{R}_m\right)^2}\right] \tag{20}$$

where $\bar{R}_m$ is the average market return over the estimation window.

Each AR is standardized for each time period t over the event window, thus obtaining standardized abnormal returns (SAR):

$$SAR_{i,t} = \frac{AR_{i,t}}{\sigma_{AR_{i,t}}} \tag{21}$$

Then, SARs are aggregated for each time period t over the event window, and cumulative standardized abnormal returns (CSAR) are calculated:

$$CSAR_t = \sum_{i=1}^{N} SAR_{i,t} \tag{22}$$

For single-day periods the test is asymptotically $N(0,1)$ distributed under the null hypothesis of no event effect, and is defined as:

$$zPatell = \frac{CSAR_t}{\sigma_{CSAR_t}} \tag{23}$$

where σ_{CSAR_t} is estimated as:

$$\sigma_{CSAR_t} = \left[\sum_{i=1}^{N} \frac{(M_i - 2)}{(M_i - 4)}\right]^{0.5} \tag{24}$$

For multiple-day periods the SARs are first aggregated over time for individual firms:

$$CSAR_{i,t1,t2} = \sum_{t=t1}^{t2} SAR_{i,t} \tag{25}$$

For multiple-day periods the test is asymptotically $N(0,1)$ distributed under the null hypothesis of no event effect, and is defined as:

$$zPatell = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} \frac{CSAR_{t1,t2}}{\sigma_{CSAR_{t1,t2}}} \tag{26}$$

where $\sigma_{CSAR_{t1,t2}}$ is estimated as:

$$\sigma_{CSAR_{t1,t2}} = \left[L_2 \frac{(M_i - 2)}{(M_i - 4)}\right]^{0.5} \tag{27}$$

4.5.4 Standardized cross-sectional test

Proposed by Boehmer, Musumeci and Poulsen (1991), this is a widely used parametric test can be considered a hybrid between the Patell (1976) and ordinary cross-sectional tests. First, residuals are standardized as in equation (21), and then, instead of using the estimation window for the calculation of the standard deviation, observations from the event-period are used to estimate the standard deviation of event-period residuals. Overall, this method benefits from the properties of the other two methods used to create this one. It allows for event-induced variance and heterogeneity in variances of residuals. However, it does not account for cross-sectional

correlation between events. The adjustment in this test is only calculated for the market model residuals. For the other two models residuals are standardized by the square root of their variance, calculated as in equation (11).

For single-day periods the test is asymptotically $N(0,1)$ distributed under the null hypothesis of no event effect, and is defined as:

$$zBMP = \frac{CSAR_t}{\sigma_{SAR_t}} \tag{28}$$

where σ_{SAR_t} is estimated as:

$$\sigma_{SAR_t} = \left[\frac{1}{(N-1)}\sum_{i=1}^{N}\left(SAR_{i,t} - \frac{1}{N}\sum_{i=1}^{N} SAR_{i,t}\right)^2\right]^{0.5} \tag{29}$$

For multiple-day periods the test is asymptotically $N(0,1)$ distributed under the null hypothesis of no event effect, and is defined as:

$$zBMP = \frac{\sum_{i=1}^{N} SCAR_{i,t1,it2}}{\sqrt{N}\sigma_{SCAR_{t1,t2}}} \tag{30}$$

where $SCAR_{i,t1,it2}$ is the standardized cumulative abnormal return for firm i, estimated as:

$$SCAR_{it1,it2} = \frac{CAR_{it1,it2}}{\sigma_{CAR_{t1,t2}}} \tag{31}$$

and $\sigma_{CAR_{t1,t2}}$ is the corrected standard deviation proposed by Mikkelson and Partch (1998), estimated as:

$$\sigma_{CAR_{t1,t2}} = \left[\sigma^2{}_{AR_i}\left[L_2 + \frac{L_2^2}{M_i} + \frac{\left(\sum_{t=T_1}^{T_2}\left(R_{m,t} - \bar{R}_m\right)\right)^2}{\sum_{t=T_0}^{T1}\left(R_{m,t} - \bar{R}_m\right)^2}\right]\right]^{0.5} \tag{32}$$

and $\sigma_{SCAR_{t1,t2}}$ is estimated as:

$$\sigma_{SCAR_{t1,t2}} = \left[\frac{1}{(N-1)} \sum_{i=1}^{N} \left(SCAR_{it1,it2} - \frac{1}{N} \sum_{i=1}^{N} SCAR_{it1,it2} \right)^2 \right]^{0.5} \quad (33)$$

4.5.5 Calendar-time test

As pointed out by prior studies (e.g. Bernard, 1987; Collins and Dent, 1984), cross-sectional dependence across residuals may induce bias in standard errors, particularly when the event occurs in the same day for all firms, or when all firms belong to the same industry. When clustering occurs, it can be accommodated by aggregating residuals into portfolios based on calendar-time (Mackinlay, 1997). In this study all firms belong to the same industry, and there are events with the same calendar date for different firms. To account for this, Jaffe's (1974) calendar time t-test is adopted. To conduct this test, clustered events are formed into portfolios according to event date, i.e., events that occurred on the same day are grouped into one equal-weighted portfolio, and firms with isolated event dates correspond to single-security portfolios. Residuals are calculated for each portfolio, and based on the AARs for each portfolio during the estimation window a time series estimate of the standard deviation is obtained for each portfolio. Finally, like in the Patell (1976) test, the event-period residuals are standardized by dividing them by the estimated standard deviation. This method takes into account correlation between residuals and non-equal variances.

For single-day periods the test is asymptotically $N(0,1)$ distributed under the null hypothesis of no event effect, and is defined as:

$$tJaffe = \frac{\overline{SAR_t}}{\sqrt{P}} \quad (34)$$

where P is the number of portfolios and $\overline{SAR_t}$ is the average standardized abnormal return, estimated as:

$$\overline{SAR_t} = \frac{\sum_{j=1}^{P} \left(\frac{AR_{j,t}}{\sigma_{AR_j}} \right)}{P} \quad (35)$$

where $AR_{j,t}$ is the abnormal return of portfolio j at event time t and $\sigma_{AR_{j,t}}$ is the standard deviation of portfolio j, estimated as in equation (11) but for portfolio residuals.

For multiple-day periods the test is asymptotically $N(0,1)$ distributed under the null hypothesis of no event effect, and is defined as:

$$tJaffe = \frac{\sum_{t=T_1}^{T_2} \overline{SAR_t}}{\sqrt{L_2}} \sqrt{P} \tag{36}$$

4.5.6 Cowan generalized sign test

This non-parametric test introduced by Cowan (1992) takes into account the fraction f of positive residuals in the estimation window and compares it with the fraction of positive residuals in a certain event window. The null hypothesis is that the fraction of positive returns is the same as in the estimation window.

For both single and multiple-day periods the test is asymptotically $N(0,1)$ distributed under the null hypothesis of no event effect, and is defined as:

$$zgsign = \frac{(w - Nf)}{\sqrt{Nf(1-f)}} \tag{37}$$

where w is the fraction of positive ARs or CARs for a certain event-period or event window, and f is estimated as:

$$\frac{1}{N} \sum_{i=1}^{N} \frac{1}{L_1} \sum_{t=T_0}^{T_1} \phi_{i,t} \tag{38}$$

where $\phi_{i,t}$ is 1 if the sign is positive and 0 otherwise.

4.5.7 Corrado rank test

The rank test procedure proposed by Corrado (1989) is a widely used non-parametric test that treats the estimation and event window as a single set of returns, and assigns a rank to each firm's residuals. Rank one is attributed to the smallest residual. $K_{i,t}$ is the rank of the abnormal return in the sample of $L_1 + L_2$ residuals of firm i. The ranks of the residuals of different days are dependent by construction. However, the effect of ignoring the dependence should be inconsequential for short event windows (Campbell and Weasley, 1993).

For single-day periods the test is asymptotically $\mathrm{N}(0,1)$ distributed under the null hypothesis of no event effect, and is defined as:

$$zrank = \frac{\overline{K_t} - (L_1 + L_2 + 1)}{\sigma_{\overline{K_t}}} \tag{39}$$

where $\overline{K_t}$ is the average rank on event day t across N stocks, and $\sigma_{\overline{K_t}}$ is estimated as:

$$\sigma_{\overline{K_t}} = \left[\frac{1}{(L_1 + L_2)} \sum_{t=T_0}^{T_2} (\overline{K_t} - (L_1 + L_2 + 1))^2 \right]^{0.5} \tag{40}$$

For multiple-day periods, the test proposed by Campbell and Wesley (1993) is utilized. The test is asymptotically $N(0,1)$ distributed under the null hypothesis of no event effect, and is defined as:

$$zrank = \sqrt{L_2} \frac{\overline{K_{t1,t2}} - (L_1 + L_2 + 1)}{\sigma_{\overline{K_t}}} \tag{41}$$

where $K_{t1,t2}$ is the average rank across firms and time in event window, and is estimated as:

$$K_{t1,t2} = \frac{1}{L_2} \sum_{t=T_1}^{T_2} \frac{1}{N} \sum_{i=1}^{N} K_{i,t} \tag{42}$$

4.6 Cross-sectional analysis of CARs

The estimated abnormal returns are frequently used as the dependent variable in a regression with firm-specific characteristics as explanatory variables. Such an exercise can provide theoretical insights and is particularly helpful when multiple sources exist for the origin of the abnormal returns, since it is an appropriate tool to investigate this association (Mackinlay, 1997). To investigate the results of the event study in greater detail, CARs are regressed against a set of explanatory variables, as expressed in the equations below:

$$CAR_i = \alpha + \beta_1 PEN_i + \beta_2 BTPROF_i + \sum_{j=3}^{J+2} \beta_j \delta_i + \beta_{J+3} CAT_i + \lambda YEAR_i + \varepsilon_i \tag{43}$$

$$CAR_i = \alpha + \beta_1 PEN_i + \beta_2 BTROA_i + \sum_{j=3}^{J+2} \beta_j \delta_i + \beta_{J+3} AGEN_i + \lambda YEAR_i + \varepsilon_i \quad (44)$$

The (-1, 1) CAR of event i is the dependent variable in a cross-sectional regression with the following firm-related explanatory variables: PEN proxies for the size of the settlement i, measured by the settlement amount divided by total assets of the correspondent bank at fiscal year-end prior to the settlement. $BTROA$ is the pre-tax return on assets of the bank correspondent to event i, measured by before-tax profitability divided by total assets, at fiscal year-end prior to the settlement. CAP is the capitalization, measured by the ratio of common equity to total assets, at fiscal year-end prior to the settlement. $SIZE$ is the size of the bank, measured by the natural logarithm of total assets, at fiscal year-end prior to the settlement. LIQ is the liquidity of the bank, calculated as the ratio of total loans to total deposits, at fiscal year-end prior to the settlement. $CREDITQ$ proxies for the credit quality of the ban, measured as the ratio of allowance for loan losses to total assets, at fiscal year-end prior to the settlement. $PORTFR$ proxies for the portfolio risk of the ban, measured as the ratio of risk-weighted assets to total assets, at fiscal year-end prior to the settlement. $SOLV$ is a measure of the solvency of the bank, measured as the Tier 1 capital ratio at fiscal year-end prior to the settlement. EFF proxies for the efficiency of the bank, measured as the ratio of operating expenses to operating income, at fiscal year-end prior to the settlement. TAX is the tax amount paid by the bank, calculated as taxes divided by pre-tax income, at fiscal year-end prior to the settlement. To investigate if settlement-specific characteristics affect CARs, the type of misconduct and the agency with whom the settlement was reached, measured by the dummy variables CAT and $AGEN$, are introduced into the regression analysis. Time dummies that control for the year in which settlement i occurred are always included ($YEAR$). All variable definitions and data sources can be consulted in **Appendix 2**. The selection of bank-specific characteristics aims to cover most of the structure of a bank and is in line with several studies investigating the determinants of profitability of banks (e.g., Athanasoglou et al., 2008; Berger, 1995; Demirgüç-Kunt and Huizinga, 1999) and event studies focused in the banking industry (e.g., Asimakopoulos and Athanasoglou, 2013; Köster and Pelster, 2017; Murphy et al., 2009).

As pointed out by Gonedes and Dopuch (1974), the error terms in this regression might be heteroskedastic if the abnormal return estimators have these properties. Karafiath (1994, 2009) provides simulation evidence on statistical tests in cross-sectional regressions using diverse estimation methods and finds that more sophisticated alternatives do not show clear advantages over OLS and WLS approaches. Moreover, under certain conditions and with a large sample size, tests using OLS are unbiased and as powerful as the WLS approach. Therefore, as suggested by Mackinlay (1997), the cross-sectional regressions are estimated via OLS with heteroskedasticity-consistent standard errors, following White (1980), and also via WLS, with the weights for each observation corresponding to the inverse of the variance of the estimation period residuals.

5. Sample selection, data sources and financial penalty trends

5.1 Sample selection and data sources

Expenses related to misconduct are usually not presented in a clear and transparent way in the publicly available bank reports. Such expenses tend to be aggregated with other expenses, making it infeasible to obtain segregated values. Therefore, due to this serious constraint I follow a different approach. Using several reliable sources of financial information (e.g. Bloomberg, Financial Times and Reuters News), public information from regulators and supervisors (e.g. Financial Conduct Authority, Federal Housing Finance Agency), as well as Violation Tracker[3] search engine, I collect data and build a hand-made dataset. This dataset includes the names of banks, the type of misconduct that originated the financial penalty, the amount of the penalty, the settlement date, and the entities imposing the penalty. Events are only considered when there is a settlement agreement. When there is more than one event on the same date for the same bank, the penalties are aggregated. To be included in the analysis, aggregate financial penalties have to be at least USD 100 million. Since not all settlements are reported in the press, it was decided that the sample would be composed of listed, well-known large banks that enjoy extensive media coverage. Considering this, all banks that used to be, and are currently included in the list of Global Systemically Important Banks (G-SIBs), published yearly by the Financial Stability Board (FSB), are included in the sample, as long as there is at least one event for the bank. The dataset

[3] Violation Tracker is a search engine on corporate misconduct that covers litigation cases initiated by 43 USA federal regulatory agencies and the Justice Department since 2010. For more information see: http://www.goodjobsfirst.org/violation-tracker

contains 25 banks from 9 different countries and a total of 195 individual financial penalties, that amount to 149 aggregate financial penalties for the period between 2010 and February 2017. However, due to the existence of concurring events that might trigger different reactions from the market the sample is reduced to 141 events. The list of banks included in the sample can be seen in **Appendix 3**, and the number of events per bank in **Appendix 4**. The number of events per regulatory entity is shown in **Appendix 5**.

Stock market data of banks and local market indexes is retrieved from *Thomson Reuters Datastream* database, while data used in the four-factor model is obtained from Kenneth French's data library. All data obtained is daily. Accounting data is collected from *Thomson Worldscope* database and also from the annual reports made available by the banks. Since currency risk might lead to biased results (Irresberger et al., 2015), all accounting data is collected in US dollars.

5.2 Summary statistics and financial penalty trends

Since there is lack of empirical studies analyzing financial penalties in the banking sector, in this section I provide an overview of the data collected for the sample, with the goal of creating new knowledge about the magnitude and dynamics of such penalties. Information is reported for all banks in the sample, and separately for non-USA and USA banks.

Summary statistics of individual financial penalties for all banks in the sample are shown in the first row of Panel A in **Table 1**. There are a total of 197 individual penalties. The average penalty is USD 1.08 billion and the median is USD 0.34 billion. As the mean and median suggest, the distribution of individual financial penalties is considerably skewed to the right. In fact, 75% of all penalties range from USD 0.09 billion to USD 0.72 billion and 90% of all penalties fall between USD 0.09 billion and USD 2.10 billion. The largest individual financial penalty in the dataset is USD 16.65 billion. Of all the individual penalties, 95 correspond to non-USA banks and the remaining 102 to USA banks. The average penalty is higher for USA banks than for non-USA banks (USD 1.51 billion versus USD 0.60 billion), and the same is verified for medians (USD 0.37 billion versus USD 0.30 billion). For non-USA banks 75% of the penalties range between USD 0.09 billion and USD 0.52 billion, while for USA banks the penalties vary from USD 0.10 billion to USD 1.15 billion. For non-USA banks, the 10% largest penalties are above USD 0.95 billion, but for USA banks the 10% top penalties surpass USD 4.90 billion. The maximum penalty for non-USA banks is USD 8.97 billion versus USD 16.65 billion for USA

Table 1
Summary statistics

Statistic	Obs	Mean	Median	75th P	90th P	SD	Min	Max	Kurt	Skew
Panel A: Individual financial penalties										
All banks	195	1.078	0.342	0.720	2.096	2.312	0.086	16.650	18.388	4.077
Non-USA banks	93	0.605	0.298	0.523	0.954	1.277	0.086	8.974	28.687	5.208
USA banks	102	1.509	0.374	1.150	4.900	2.896	0.100	16.650	11.114	3.250
Panel B: Aggregate financial penalties										
All banks	149	1.410	0.410	1.080	3.330	2.676	0.100	16.650	12.865	3.449
Non-USA banks	63	0.893	0.340	0.822	2.324	1.571	0.100	8.974	15.097	3.730
USA banks	86	1.789	0.463	1.525	5.300	3.214	0.100	16.650	8.549	2.914
Panel C: Cross-sectional analysis variables										
PEN	141	0.009	0.003	0.008	0.035	0.015	0.000	0.079	6.803	2.640
BTROA	141	0.006	0.005	0.011	0.013	0.006	-0.008	0.024	-0.189	0.304
CAP	141	0.079	0.087	0.104	0.112	0.027	0.025	0.129	-1.261	-0.268
SIZE	141	21.226	21.380	21.541	21.636	0.470	18.852	21.749	4.477	-1.807
LIQ	141	0.779	0.805	0.914	1.060	0.261	0.119	1.669	1.364	-0.163
CREDITQ	141	0.009	0.007	0.013	0.017	0.007	0.000	0.049	6.627	1.704
PORTFR	141	0.474	0.511	0.627	0.693	0.175	0.122	0.817	-1.086	-0.161
SOLV	141	0.132	0.129	0.137	0.163	0.019	0.093	0.213	2.094	1.211
EFF	141	0.747	0.743	0.862	0.959	0.148	0.447	1.156	-0.407	0.502
TAX	141	0.332	0.264	0.312	0.541	1.098	-0.692	7.287	33.256	5.560

This table presents descriptive statistics on individual financial penalties, aggregate financial penalties and for all variables used in the cross-sectional regression analysis. I report the number of observations, mean values, median values, 75th and 90th percentiles, standard deviation values, minimum values, maximum values, and also kurtosis and skewness coefficients. Descriptive statistics in Panels A and B are reported in USD bn. Definition of Panel C variables and data sources can be consulted in **Appendix 2**.

banks. Summary statistics for aggregate financial penalties are shown in Panel B of **Table 1**. Of course, due to the aggregation process almost all statistics exhibit higher values but the same conclusions as before apply to aggregate financial penalties.

Fig. 1 to Fig. 3 show the number and total amount of individual financial penalties per year, for all banks, non-USA banks and USA banks. The number and total sum of penalties strongly increased from 2011 to 2012, from 11 to 25, and total sums of USD 10.09 billion to USD 33.94 billion. The average penalty also increased from USD 1.19 billion to USD 1.36 billion. Non-USA banks were imposed more penalties than USA banks, but the latter were responsible for a total sum of USD 28.46 billion in settlements, as 2012 was the year in which USA authorities most notably started to go after banks and punish them for their role in the latest global financial crisis. In 2013 penalties grew once again both in number and value, with USA banks being responsible for more than USD 44 billion. However, 2014 stands as the year with the largest number of financial penalties and settlement amounts. Non-USA banks reached 26 settlements totaling almost USD 17 billion, while USA banks attained 21 settlements amounting to USD 45.5 billion. In 2015, despite being the year with the second largest number of penalties, it was the year with the lowest average settlement (USD 0.37 billion) since 2010. It was also the first year, in which non-USA banks' settlements surpassed their American counterparts, totaling USD 9.73 and USD 5.22 billion respectively. In 2016 there was a considerable decrease in the number of settlements (40 to 23), but the total amount of penalties increased almost 3 billion. Finally, until the end of February of 2017 there was a total of 5 settlements, with two of them being particularly large, both corresponding to non-USA banks.

Fig. 4 shows the total financial penalties paid by banks categorized into seven different groups. It is clear that non-USA banks and USA banks have essentially been punished for different kinds of misconduct. Financial penalties imposed to American banks arise mostly from two kinds of misconduct: misseling of financial products to investors and errors in foreclosure processes. Usually, such settlements are civil law cases, and the payments that the banks are obliged to make are compensatory in nature, therefore being tax deductible under USA tax law. On the contrary, non-USA banks have been penalized for, in addition to misseling towards investors, violation of sanctions and market manipulation. Therefore, a large part of settlements for non-USA banks corresponds to cases with criminal charges.

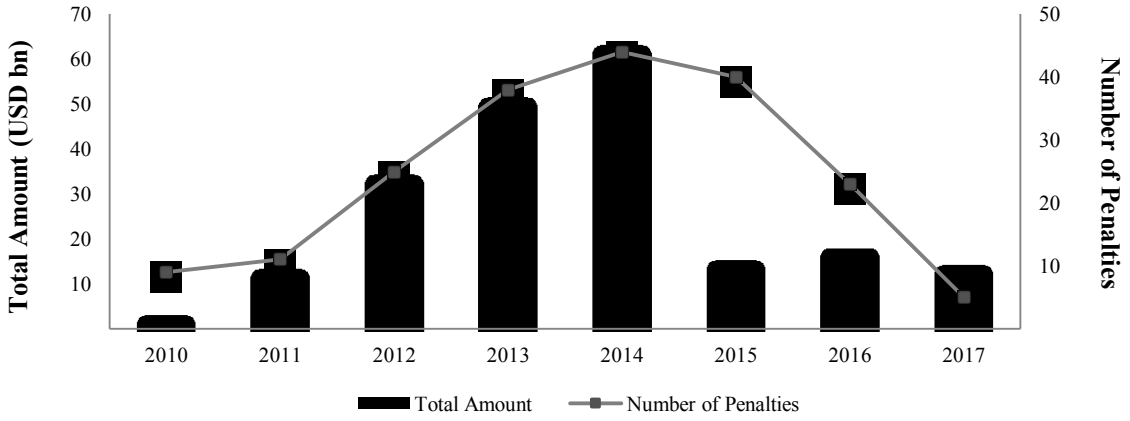

Fig. 1 – Number and total amount of financial penalties by year (2017 only includes 2 months): All Banks

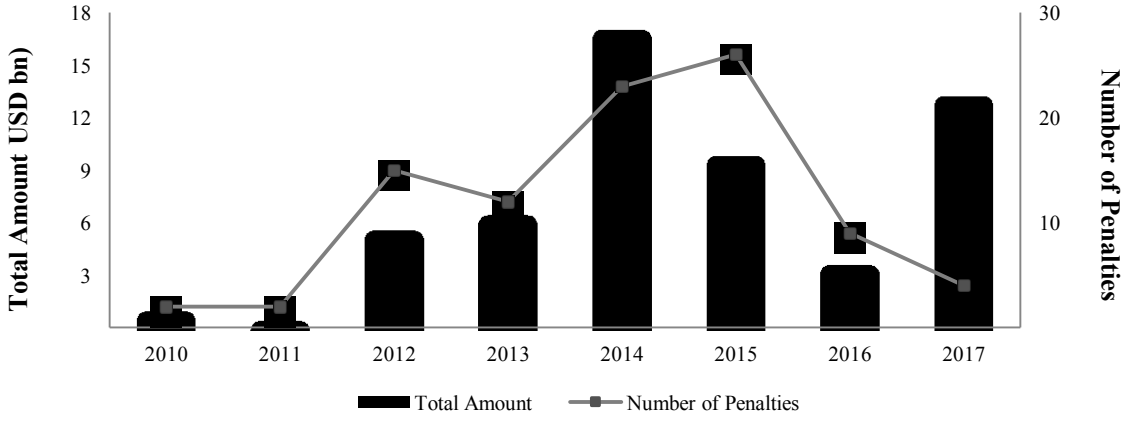

Fig. 2 – Number and total amount of financial penalties by year (2017 only includes 2 months): Non-USA Banks

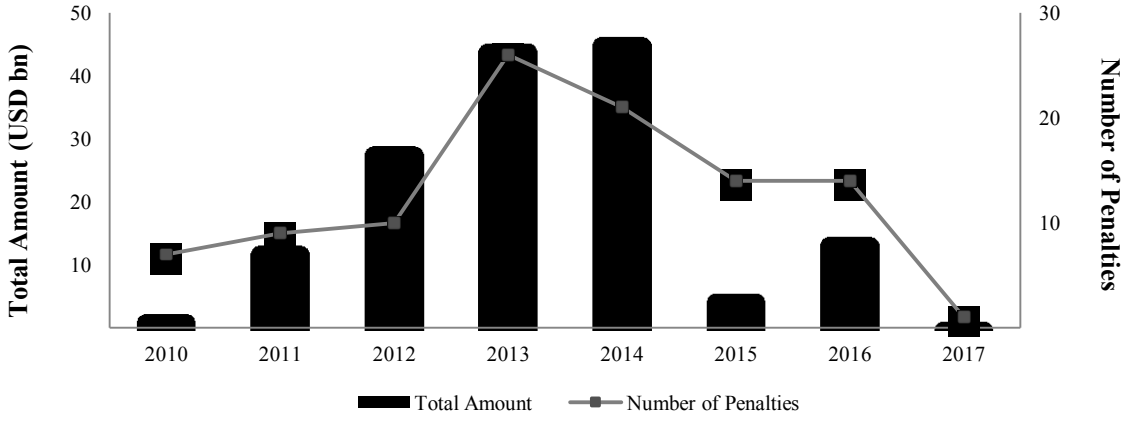

Fig. 3 – Number and total amount of financial penalties by year (2017 only includes 2 months): USA Banks

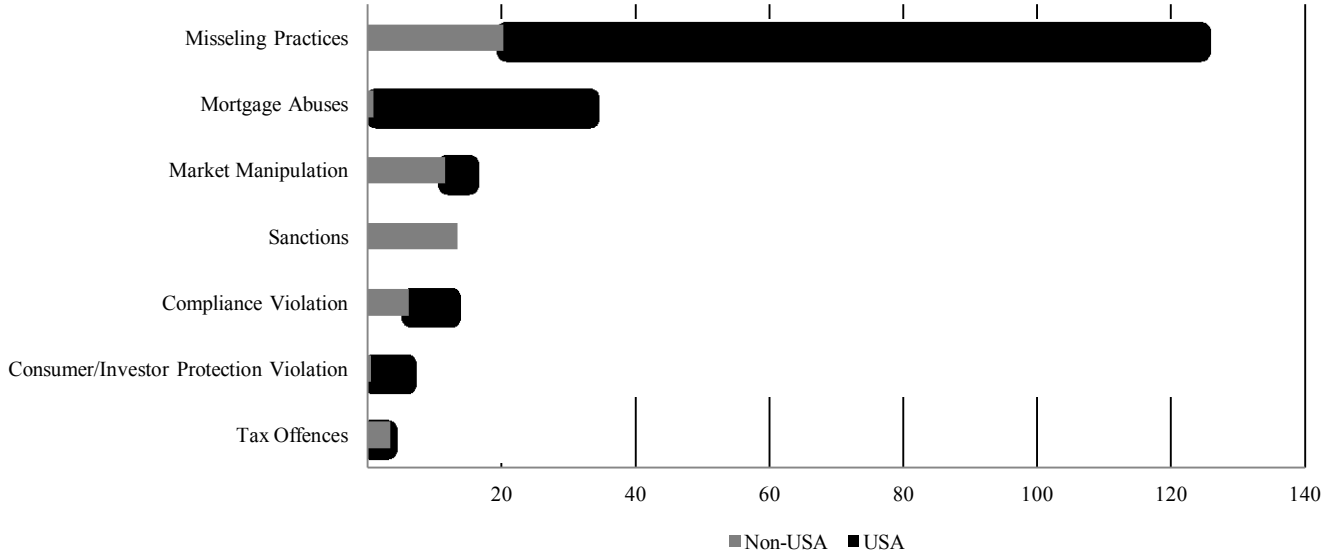

Fig. 4 - Total amount (USD bn) of financial penalties categorized into seven different groups. "Misseling Practices" mainly includes settlements involving the misseling of mortgage-backed securities and credit default obligations. The grand majority of such settlements correspond to practices engaged during the period before and after the 2007-2009 global financial crises. "Mortgage Abuses" consists in settlements related to errors in foreclosure processes. "Market Manipulation" involves financial penalties applied to banks that engage in practices that are seen as manipulations of financial markets (e.g. LIBOR rigging). "Sanctions" includes penalties imposed to banks that engage in activities with countries present in USA's OFAC sanctions list. "Compliance Violation" includes different violations against rules (e.g. anti-money laundering deficiencies). "Consumer/Investor Protection Violation" comprises different practices of misconduct that harm costumers or investors (e.g. discriminatory lending practices against minorities or misuse of customer cash). "Tax Offences" includes financial penalties imposed to banks that help customers to evade taxes.

Misseling of financial products to investors (e.g. mortgage-backed securities or credit default obligations) is the source of more than half of the total financial penalties in the sample, with a total value of almost USD 125 billion. Banks from USA paid the majority of this amount, with a total of USD 104.40 billion. The main reason for this is that USA authorities started to charge banks earlier for their role in the most recent global crisis. Shortly after the crisis, President Barack Obama created several agencies and mechanisms to combat financial crime. Most notably, in 2012 the Residential Mortgage-Backed Securities (RMBS) Working Group was created. Its main goal is to "*investigate and prosecute misconduct by financial institutions in the origination and securitization of mortgages*". There are 60 individual financial penalties of this kind in the sample. The average penalty in this category is around USD 2.1 billion, and the largest penalty is USD 16.65 billion, paid by Bank of America in 2014. In second place are financial penalties imposed to banks due to abuses in foreclosure processes, with a total amount of USD 33.64 billion. Again, banks from USA are responsible for almost the total amount. This is explained by the joint state-federal settlements with the biggest USA banks shortly after the crisis period, most notably the *National Mortgage Settlement* in 2012 and the *Foreclosure Settlement Review* in 2013. Although there are only 13 penalties of this type, the average penalty is the largest amongst all categories, with a value of USD 2.59 billion. The highest amount is USD 11.8 billion, correspondent to a settlement reached with Bank of America in 2012.

Penalties resulting from market manipulation rank third with a total value of USD 15.64 billion. Opposed to the two previous classes of misconduct, non-USA banks are responsible for the majority of the sum. The LIBOR (first disclosed in 2012) and Forex (first disclosed in 2013) scandals and their resulting settlements contribute heavily to this category. In both cases several big banks, acting as cartels, cooperated and engaged in erratic behaviors in order to achieve financial gains through the manipulation of benchmark interest rates and interest rate derivatives. There are 47 settlements in this category, with an average penalty of USD 0.33 billion. The largest penalty is USD 0.98 billion, paid by Deutsche Bank to the European Commission in 2013. Penalties imposed due to engaging in transactions with countries subject to USA sanctions amount to USD 13.40 billion, with an enormous (and the largest of this type) penalty of USD 8.97 billion imposed to BNP Paribas in 2014

representing more than half of this sum. On average, settlements in this category are around USD 0.91 billion. It is noteworthy to highlight that, in this sample, no USA banks have been penalized for this reason. Compliance violations seem to be common both in USA and non-USA banks, with a total amount of USD 12.88 billion for 36 different individual settlements, and an average penalty of USD 0.36 billion. Misconduct practices that may harm consumers and/or investors are more common in USA banks, with a total sum of roughly USD 6.50 billion for 19 individual penalties, and an average penalty of USD 0.34 billion. Lastly, penalties imposed due to helping clients to evade taxes are only verified in non-USA banks. In total, this is the most uncommon type of misconduct, with only 6 settlements, totaling USD 3.39 billion.

In terms of agencies with whom settlements are reached, the U.S Department of Justice (DOJ) is responsible for a total amount of USD 74.11 billion, most of which resulting from cases related to misseling of financial securities. The years with the largest sums were 2014 (USD 28 billion) and 2013 (USD 13 billion) In second comes the Federal Housing Finance Agency (FHFA) with a total sum of USD 35.94 billion, with almost the entirety of this amount corresponding to 2014 (USD 15.65 billion) and 2013 (USD 17.50 billion). Appendixes 6 to 10 report a detailed coverage of settlements per category, for all banks, non-USA banks and USA banks. Appendix 9 reports settlements per agency. Appendix 10 reports settlements per agency and category. The coverage includes the number of penalties, total sum, average, maximum and penalties.

6. Results

6.1 Event study results

As mentioned, there are a total of 141 events (see **Appendix 11**), of which 61 correspond to non-USA banks and the remaining 80 to USA banks. **Fig. 5** shows the development of average returns from 4 trading days before the event to 4 trading days after the event for the full sample and for the MSCI World Banks Index. Even without the event study results, it seems clear that the settlement announcements have a positive impact on the price of stocks. The graph shows that the average sample returns on the 3 days surrounding the event are clearly higher than the MSCI World Banks Index average returns.

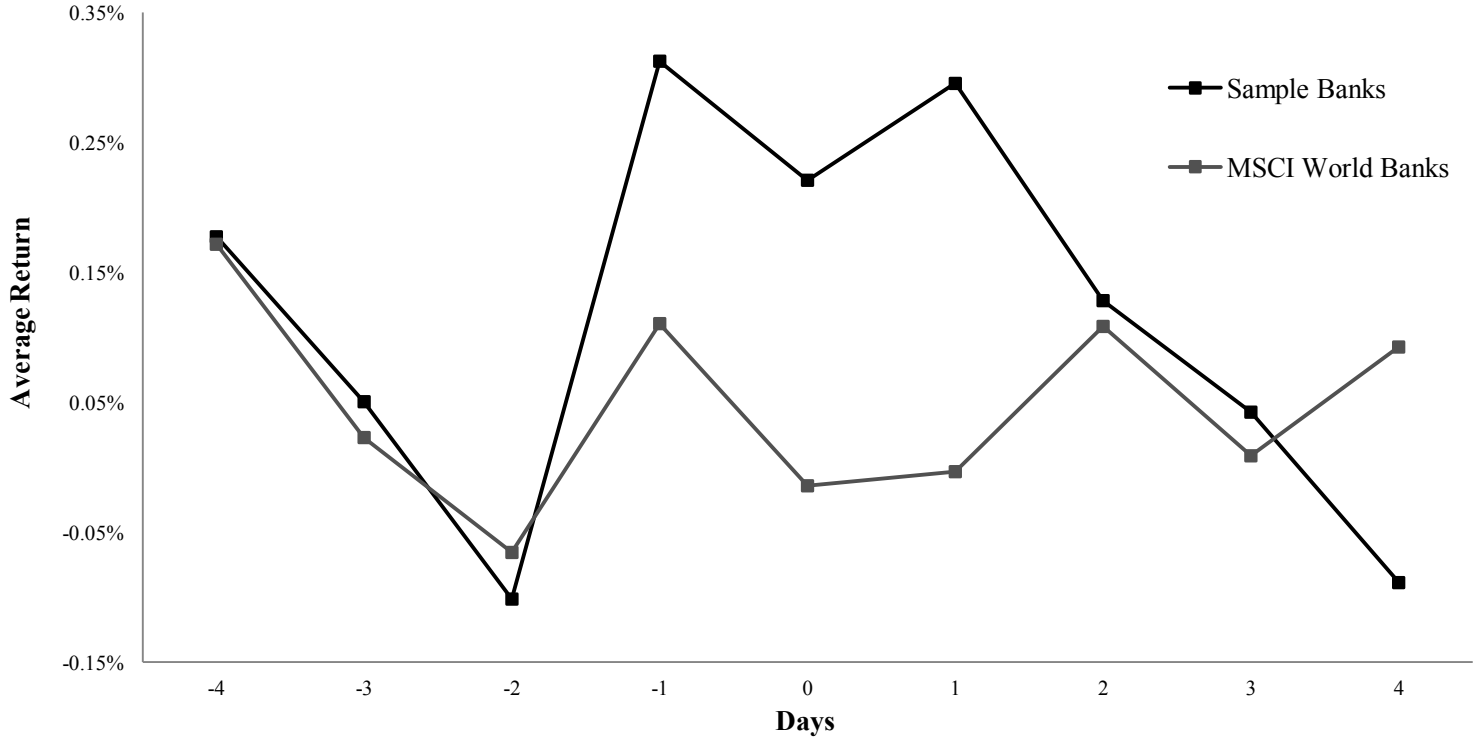

Fig. 5 – Evolution of average returns from 4 trading days before to 4 trading days after the settlement for the full sample and for the MSCI World Banks Index. Days are relative to the event date (t=0).

Event study results are shown in **Table 2** for all banks, **Table 3** for non-USA banks, and **Table 4** for USA banks.

Panel A of **Table 2** reports the CAARs and test statistics for four different event windows based on the market model for all settlements. Panel B reports the same results based on the ARs generated through the two-index model. In Panel C the same results are presented based on the four-factor model. All models show that the market reaction is positive on the day of the event. The AAR is around 0.26% based on the market model, 0.22% based on the two-index model, and 0.30% assuming the four-factor model. Parametric tests show statistical significance in all models, but the generalized sign test is not significant in any of the models and the rank test only shows positive significance when the market and four-factor models are used. The CAAR on the three-day window (that includes the day before, the event day, and the day after the event) is the largest in absolute value of all windows analyzed for all models, with values of 0.72%, 0.66% and 0.64% corresponding to the market model, two-index model and four-factor model, respectively. All CAARs for the (-1, 1) window are significantly positive based on all tests, with the exception of the generalized sign test. The mean CARs are also positive and significant in two different two-day windows (both include the event day and one includes the day before and the other the day after the event). The CAAR for the (0, 1) window is the second largest in absolute value for all models (ranges from 0.49% to 0.56%), and also significant based on the parametric tests for all models and non-parametric tests for some models. Despite being the smallest in absolute value (varies from 0.39% to 0.43%) the mean CAR for the (-1, 0) window is also significantly positive based on most of the tests. To take into account the correlation between banks' ARs when the event day is the same the calendar-time approach is also used for robustness. The results are shown in **Appendix 12** and corroborate the results of the other parametric test statistics discussed above. By comparing the parametric and non-parametric approaches, it seems that the presence of extreme positive values might be over-influencing the results of the parametric tests, since non-parametric tests, particularly the generalized sign test, do not indicate positive abnormal performance in some windows. This is not surprising since each settlement is unique, in the sense that the outcome and terms reached depend on the specificities of each particular case. Additionally, media coverage of litigation cases is not homogeneous, and

Table 2

Cumulative abnormal returns following the resolution of litigation for all banks.

Panel A: Market Model				
Observations	141	141	141	141
Window	(0)	(-1,1)	(-1,0)	(0,1)
CAAR	0.0026	0.0072	0.0043	0.0056
Ordinary t-test	2.191**	3.459***	2.530**	3.256***
CDA test	2.135**	3.371***	2.465**	3.173***
Patell test	2.427**	3.451***	2.587***	3.357***
BMP test	2.297**	3.543***	2.566**	3.452***
Generalized sign test	1.547	1.547	1.378	1.378
Corrado rank test	1.701*	2.479**	1.922*	2.317**
Panel B: Two-Index Model				
Observations	141	141	141	141
Window	(0)	(-1,1)	(-1,0)	(0,1)
CAAR	0.0022	0.0066	0.0039	0.0049
Ordinary t-test	1.970**	3.407***	2.489**	3.077***
CDA test	1.880*	3.252***	2.376**	2.937***
Patell test	2.086**	3.188***	2.375**	3.004***
BMP test	1.913*	3.251***	2.326**	3.060***
Generalized sign test	1.310	1.478	0.973	1.141
Corrado rank test	1.254	1.980**	1.539	1.773*
Panel C: Four-Factor Model				
Observations	141	141	141	141
Window	(0)	(-1,1)	(-1,0)	(0,1)
CAAR	0.0030	0.0064	0.0039	0.0055
Ordinary t-test	2.856***	3.546***	2.649***	3.713***
CDA test	2.829***	3.513***	2.624***	3.679***
Patell test	3.203***	3.679***	2.808***	3.963***
BMP test	3.065***	3.849***	2.897***	4.112***
Generalized sign test	1.114	2.630***	1.283	2.293**
Corrado rank test	2.197**	2.631***	1.787*	2.989***

This table presents the CAARs and correspondent significance tests for all banks in the sample for different event windows. Panel A reports the results based on the market model abnormal returns, Panel B shows the results based on the two-index model abnormal returns, and Panel C presents the results based on the four-factor model abnormal returns. Parameters for all models are estimated over a 250-day estimation window. Statistical significance of CAARs was assessed using the parametric and non-parametric tests described in **section 4.5**. BMP Test is referred to as standardized cross-sectional test within the text. Statistical significance is indicated by ***, **, and * at the 1%, 5% and 10% levels, respectively.

Table 3

Cumulative abnormal returns following the resolution of litigation for non-USA banks.

Panel A: Market Model				
Observations	61	61	61	61
Window	(0)	(-1,1)	(-1,0)	(0,1)
CAAR	0.0028	0.0075	0.0051	0.0052
Ordinary t-test	1.465	2.293**	1.903*	1.942*
CDA test	1.490	2.332**	1.935*	1.974*
Patell test	1.937*	2.508**	2.491**	1.951*
BMP test	2.433**	2.760***	2.817***	2.276**
Generalized sign test	1.914*	0.890	1.146	1.146
Corrado rank test	2.112**	1.969**	2.347**	1.558
Panel B: Two-Index Model				
Observations	61	61	61	61
Window	(0)	(-1,1)	(-1,0)	(0,1)
CAAR	0.0022	0.0066	0.0046	0.0041
Ordinary t-test	1.265	2.160**	1.873*	1.667*
CDA test	1.300	2.220**	1.925*	1.713*
Patell test	1.791*	2.456**	2.467**	1.807*
BMP test	1.952*	2.747***	2.696***	2.090**
Generalized sign test	2.216**	1.447	0.935	1.447
Corrado rank test	1.929*	1.929*	2.433**	1.294
Panel C: Four-Factor Model				
Observations	61	61	61	61
Window	(0)	(-1,1)	(-1,0)	(0,1)
CAAR	0.0027	0.0078	0.0046	0.0059
Ordinary t-test	1.473	2.488**	1.782*	2.306**
CDA test	1.483	2.505**	1.795*	2.322**
Patell test	1.743*	2.758***	2.184**	2.426**
BMP test	1.970**	2.909***	2.427**	2.596***
Generalized sign test	0.380	2.173**	0.892	1.404
Corrado rank test	1.466	2.128**	1.623	2.019**

This table presents the CAARs and correspondent significance tests for non-USA banks for different event windows. Panel A reports the results based on the market model abnormal returns, Panel B shows the results based on the two-index model abnormal returns, and Panel C presents the results based on the four-factor model abnormal returns. Parameters for all models are estimated over a 250-day estimation window. Statistical significance of CAARs was assessed using the parametric and non-parametric tests described in **section 4.5**. BMP Test is referred to as standardized cross-sectional test within the text. Statistical significance is indicated by ***, **, and * at the 1%, 5% and 10% levels, respectively.

Table 4

Cumulative abnormal returns following the resolution of litigation for USA banks.

Panel A: Market Model				
Observations	80	80	80	80
Window	(0)	(-1,1)	(-1,0)	(0,1)
CAAR	0.0026	0.0070	0.0037	0.0058
Ordinary t-test	1.629	2.590***	1.687*	2.638***
CDA test	1.436	2.283**	1.487	2.325**
Patell test	1.531	2.392**	1.259	2.753***
BMP test	1.252	2.331**	1.153	2.605***
Generalized sign test	0.381	1.277	0.829	0.829
Corrado rank test	0.507	1.567	0.602	1.676*
Panel B: Two-Index Model				
Observations	80	80	80	80
Window	(0)	(-1,1)	(-1,0)	(0,1)
CAAR	0.0022	0.0067	0.0034	0.0054
Ordinary t-test	1.513	2.642***	1.659*	2.647***
CDA test	1.319	2.303**	1.446	2.307**
Patell test	1.205	2.088**	0.999	2.410**
BMP test	0.996	1.996**	0.915	2.258**
Generalized sign test	-0.196	0.699	0.475	0.251
Corrado rank test	0.121	1.011	0.099	1.225
Panel C: Four-Factor Model				
Observations	80	80	80	80
Window	(0)	(-1,1)	(-1,0)	(0,1)
CAAR	0.0032	0.0053	0.0034	0.0052
Ordinary t-test	2.652***	2.541**	1.985**	3.003***
CDA test	2.493**	2.389**	1.866*	2.823***
Patell test	2.730***	2.476**	1.820*	3.143***
BMP test	2.361**	2.562**	1.779*	3.171***
Generalized sign test	1.148	1.595	0.924	1.818*
Corrado rank test	1.643	1.674*	0.997	2.215**

This table presents the CAARs and correspondent significance tests for USA banks for different event windows. Panel A reports the results based on the market model abnormal returns, Panel B shows the results based on the two-index model abnormal returns, and Panel C presents the results based on the four-factor model abnormal returns. Parameters for all models are estimated over a 250-day estimation window. Statistical significance of CAARs was assessed using the parametric and non-parametric tests described in **section 4.5**. BMP Test is referred to as standardized cross-sectional test within the text. Statistical significance is indicated by ***, **, and * at the 1%, 5% and 10% levels, respectively.

For some smaller cases the settlement announcement might be the first time the case is actually covered. Both of these factors will influence investors' reaction after a settlement. The assumption is that settlements are generally good news for investors, but if the outcome of a given settlement is anticipated beforehand and propagated throughout the media, if the announcement confirms it, it is expected a minor reaction from the market. On the other hand, when the outcome of a case is deemed to be much better for the bank than what was anticipated, or when not much was known about the case, it is expected that market participants react in a positive manner. Therefore, the presence of extreme positive ARs in the sample is expected.

The results obtained for the full sample indicate that the resolution of unsolved litigation through settlements triggers a positive reaction from investors on the announcement day. Moreover, when analyzing event windows with more than one day the positive reaction persists. This might indicate that sometimes important information regarding a case's resolution is already known by investors before it becomes public, while in other cases it's not. To investigate this, the two sub-samples are analyzed separately (see **Appendix 13** for descriptive statistics). Longer event windows were tested (results not reported), but conclusions identical to the ones of Köster and Pelster (2017) were obtained. That is, the announcements only have a short-term impact on the stock price of affected banks.

Table 3 reports the results for non-USA banks and **Table 4** for USA. banks. The mean CAR in the event day for non-USA banks is 0.28%, 0.22% and 0.27% according to the market model, two-index model and four-factor model, respectively. It is significantly positive based on the Patell and standardized cross-sectional tests for all models. Significance based on non-parametric tests varies depending on the model of choice. For USA banks the event day AAR is 0.26%, 0.22% and 0.32% based on the previously mentioned models, and it is only significantly positive when considering the four-factor model, based on all parametric approaches. The CAAR for non-USA banks ranges from 0.66% to 0.78% for the (-1, 1) window depending on the model used, and for USA banks varies from 0.53 to 0.70% for the same window also according to different models. The largest mean CAR for non-USA and USA banks is generated by the four-factor model and the market model, respectively. For both sub-samples, the mean CAR is positive and

significant based on all parametric tests. With regard to non-parametric tests, for non-USA banks the rank test always suggests significantly positive ARs, while the generalized sign test is only significant for the four-factor model. For USA banks non-parametric tests suggest that there is no abnormal performance in the (-1, 1) window. More importantly, differences between sub-samples are patent when the two different two-day event windows are analyzed. For non-USA banks the CAAR for the (-1, 0) window varies between 0.46% and 0.51% depending on the model used and is significantly positive for all models based on all parametric tests and the rank test (apart from the four-factor model). The same does not apply to USA banks, since the majority of tests in all models do not detect positive ARs. For the (0, 1) event window both sub-samples seem to present significantly positive ARs. The mean CAR for USA banks ranges from 0.52% and 0.58% and is significant based on all parametric tests for all models. Again, non-parametric tests results depend on the model of choice. For non-USA banks the CAAR for the same window ranges from 0.41% and 0.59% and results similar to the USA banks ones are obtained, but with weaker significance levels (apart from the standardized cross-sectional test).

By analyzing the two sub-samples, it seems that sometimes for non-USA banks significant information about the resolution of litigation leaks before the announcement is covered by the media, while for USA banks this does not happen. Moreover, the settlements do trigger positive ARs for non-USA banks on the day they are announced, while the same is not verified for USA banks. One possibility is that deals with USA banks are often announced after the market closed (only the day of the announcement is considered, not the exact time of the announcement), so the effect of the announcement is only known on the next trading day. Finally, the positive reaction to the news seems to extend to the trading day after the announcement for both sub-samples, but appears to be more significant for USA banks.

Overall, these results do seem to confirm that the resolution of pending litigation through settlements is received positively by investors. As previously mentioned the resolution of litigation removes uncertainty about the case and puts an end to further negative coverage by the media. The positive ARs also indicate that investors are pleased with the terms of the settlement, indicating that the magnitude of the penalty, taking into account the economic gain accrued from the misconduct, is smaller than anticipated. It might also be the case that

the amounts provisioned are in excess of the penalties imposed. In this case, the announcement allows banks to reveal good news to the market. Other reasons that can explain this reaction from the market participants include the partial tax deductibility of the penalties imposed, and cessation of the erratic behaviors that led to the penalties. In fact, most settlements reached through consent orders, deferred prosecution agreements and non-prosecution agreements include remediation commitments that demand behavioral changes, and investors perceive it as good news.

6.2 Cross-sectional analysis results

Tables 5 to 7 show the results of the cross-sectional regression analysis of the (-1, 1) window CARs. Panel A of each table presents the results using OLS with robust standard errors, while Panel B shows the results using WLS with robust standard errors. Model (1) is the baseline regression. Model (2) is used to control for possible effects of outliers. To reduce the impact of extreme values all variables are winsorized at the 2% level. In Model (4) robust standard errors are clustered by bank. Model (5) adds a binary variable to baseline regression that assumes the value of 1 when the CAR corresponds to a USA bank. **Appendixes 14 to 16** present the effect of the agency with whom the settlement was reached on CARs and **Appendixes 17 to 19** show the effect of misconduct type on CARs.

The relative size of the penalty exhibits a significant positive effect on CARs in all models for all panels for all return generating models. Larger penalties are imposed when large economic gains for the banks resulted from the misbehaviors. Larger settlements tend also to correspond to cases that are extensively covered by the media but whose outcome is not easily predictable. The settlement amount might also be lower than the amount provisioned by banks. The resolution of major lawsuits ends the negative coverage by the media and investors might consider that the settlements obtained indicate that banks get away lightly. For these reasons, it is not surprising that larger penalties trigger exceptionally positive reactions from investors. Additionally, the largest settlements in the sample correspond to USA banks and most of them include compensatory payments (mostly in the form of consumer relief) which are tax deductible under USA law. Banks' efficiency also seems to

Table 5

Multivariate analysis of (-1, 1) market model CARs[4].

	Panel A: OLS Robust S.E.				**Panel B: WLS Robust S.E.**			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
PEN	0.349***	0.367***	0.349***	0.362***	0.491***	0.507***	0.491***	0.506***
BTROA	-0.904	-0.909	-0.904	-0.725	-0.581	-0.564	-0.581	-0.486
CAP	0.207	0.230	0.207	0.418*	0.171	0.192	0.171	0.312
SIZE	-0.007	-0.005	-0.007	-0.005	0.001	0.002	0.001	0.002
LIQ	0.007	0.004	0.007	-0.004	0.006	0.004	0.006	-0.003
CREDITQ	-0.343	-0.078	-0.343	-0.263	-0.073	0.197	-0.073	-0.025
PORTFR	-0.039	-0.047	-0.039	-0.041	-0.039	-0.046	-0.039	-0.037
SOLV	0.093	0.1341	0.093	0.075	0.150	0.170	0.150	0.141
EFF	-0.053*	-0.055**	-0.053**	-0.048	-0.046*	-0.045*	-0.046*	-0.041
TAX	0.002	0.002	0.002**	0.002	0.002	0.002	0.002	0.003
USA				-0.016				-0.012
INTERCEPT	0.198	0.146	0.198	0.158	0.004	-0.024	0.004	-0.019

This table presents the results of regressing the (-1, 1) market model CARs on a set of explanatory variables. Panel A presents the results using as estimation method OLS with robust standard errors, while for panel B WLS with robust standard errors is used. Model (1) is the baseline regression. In model (2) variables are winsorized at the 2% level. In model (3) the baseline regression is estimated with robust standard errors clustered by bank. In Model (4) a dummy variable indicating whether it is a USA or non-USA bank is added to the baseline regression. Dummy variables that control for the year of each observation are included in all models. Statistical significance is indicated by ***, **, and * at the 1%, 5% and 10% levels, respectively.

[4] I also run all regressions without the variable PEN. In Panel A variable EFF becomes non-significant in model (1). In Panel B variable EFF becomes non-significant in models (1), (2) and (3), and variable TAX becomes significant in model (4).

Table 6

Multivariate analysis of (-1, 1) two-index model CARs[5]

	Panel A: OLS Robust S.E.				**Panel B: WLS Robust S.E.**			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
PEN	0.336***	0.349***	0.336***	0.354***	0.425***	0.436***	0.425***	0.445***
BTROA	-0.815	-0.771	-0.815	-0.570	-0.590	-0.550	-0.590	-0.458
CAP	0.208	0.223	0.208	0.497**	0.190	0.215	0.190	0.387*
SIZE	-0.008	-0.006	-0.008	-0.005	0.000	0.001	0.000	0.001
LIQ	0.000	-0.001	0.000	-0.014	0.003	0.002	0.003	-0.009
CREDITQ	-0.103	0.127	-0.103	0.007	0.087	0.338	0.087	0.150
PORTFR	-0.048	-0.053	-0.048	-0.050	-0.043	-0.050	-0.043	-0.040
SOLV	0.019	0.055	0.019	-0.007	0.060	0.079	0.060	0.044
EFF	-0.054*	-0.053**	-0.054**	-0.047*	-0.042	-0.040	-0.042*	-0.035
TAX	0.002*	0.002*	0.002**	0.003*	0.002	0.002	0.002*	0.003*
USA				-0.022**				-0.016
INTERCEPT	0.224	0.174	0.224*	0.168	0.043	0.019	0.043	0.010

This table presents the results of regressing the (-1, 1) two-index model CARs on a set of explanatory variables. Panel A presents the results using as estimation method OLS with robust standard errors, while for panel B WLS with robust standard errors is used. Model (1) is the baseline regression. In model (2) variables are winsorized at the 2% level. In model (3) the baseline regression is estimated with robust standard errors clustered by bank. In Model (4) a dummy variable indicating whether it is a USA or non-USA bank is added to the baseline regression. Dummy variables that control for the year of each observation are included in all models. Statistical significance is indicated by ***, **, and * at the 1%, 5% and 10% levels, respectively.

[5] I also run all regressions without the variable PEN. In Panel A variable EFF becomes non-significant in model (4). In Panel B variable EFF becomes non-significant in model (3).

Table 7

Multivariate analysis of (-1, 1) four-factor model CARs[6].

	Panel A: OLS Robust S.E.				**Panel B: WLS Robust S.E.**			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
PEN	0.321***	0.336***	0.321***	0.333***	0.346***	0.356***	0.346***	0.358***
BTROA	0.141	-0.066	0.141	0.306	0.070	-0.085	0.070	0.153
CAP	0.001	-0.007	0.001	0.195	0.010	-0.005	0.010	0.140
SIZE	-0.008	-0.007	-0.008	-0.006	0.000	0.000	0.000	0.001
LIQ	-0.001	0.001	-0.001	-0.011	0.000	0.002	0.000	-0.009
CREDITQ	0.252	0.262	0.252	0.326	0.570	0.607	0.570	0.609
PORTFR	-0.036	-0.031	-0.036	-0.037	-0.032	-0.027	-0.032	-0.030
SOLV	-0.062	0.011	-0.062	-0.079	0.101	0.159	0.101	0.086
EFF	-0.032	-0.040	-0.032	-0.027	-0.032	-0.038	-0.032	-0.028
TAX	0.003*	0.003*	0.003***	0.003*	0.003*	0.003*	0.003**	0.003*
USA				-0.015				-0.011
INTERCEPT	0.217	0.203	0.217	0.180	0.029	0.023	0.029	-0.001

This table presents the results of regressing the (-1, 1) four-factor model CARs on a set of explanatory variables. Panel A presents the results using as estimation method OLS with robust standard errors, while for panel B WLS with robust standard errors is used. Model (1) is the baseline regression. In model (2) variables are winsorized at the 2% level. In model (3) the baseline regression is estimated with robust standard errors clustered by bank. In Model (4) a dummy variable indicating whether it is a USA or non-USA bank is added to the baseline regression. Dummy variables that control for the year of each observation are included in all models. Statistical significance is indicated by ***, **, and * at the 1%, 5% and 10% levels, respectively.

[6] I also run all regressions without the variable PEN. In Panel A there are no changes. In Panel B variable EFF becomes non-significant in model (2), and variable TAX becomes non-significant in models (1) and (4).

affect the ARs experienced upon resolution of litigation. The variable EFF coefficient is negative and significant in most models of panel A for **Tables 5 and 6**. This negative effect on CARs is reasonable since the additional cost of financial penalties has a negative impact in the results and earnings of affected banks. Therefore, banks with higher efficiency ratios (i.e. less efficient) experience lower CARs than more efficient banks. The variable TAX coefficient is positive and significant for most models in panel A of **Tables 6 and 7** and for some models in panel B of the same tables. This finding is consistent with the tax deductibility property of some financial penalties. Assuming all else equal, banks with higher effective tax rates seem to experience larger positive CARs. The binary variable controlling for differences between USA and non-USA banks is negative but only significant in panel A of **Table 6**, so there is not enough evidence to conclude that CARs for USA banks are smaller than for non-USA banks.

As for the impact of specific agencies on CARs, settlements reached with the Federal Housing Financing Agency (FHFA) seem to prompt lower CARs when compared to other agencies, since the coefficient of the correspondent dummy variable is negative and significant in all panels of **Appendixes 14 to 16**. FHFA, in the role of conservator of Freddie Mac and Fannie Mae, alongside private lawyers filed 18 suits in 2011 against major banks, long before other agencies went after banks, accusing them of misrepresenting about USD 200 billion in mortgage-backed securities sold to Freddie Mac and Fannie Mae, alleging a variety of violations of federal securities law and civil law[7]. Apparently, the deals reached with FHFA do not seem to have pleased investors in the same way other deals have. On the contrary, settlements with private entities appear to be particularly good news, since the respective dummy variable coefficient is significant and positive in most panels of **Appendixes 14 to 16**.

Finally, with respect to the impact of misconduct type on CARs, it was found that the dummy variable correspondent to foreclosure abuses is significant and positive for both panels in **Appendixes 17 and 18**. Considering that, as previously mentioned, USA banks are responsible for almost the total amount of settlements in this category (see **Fig. 4**), this

[7] https://www.reuters.com/article/us-otc-fhfa/fhfas-mbs-litigation-offers-25-billion-reasons-why-government-should-hire-private-law-firms-idUSKBN19Y2M7

can be considered as evidence that settlements resulting in financial penalties that can be deducted for tax purposes are particularly well received by investors. In fact, penalties for foreclosure abuses can be considered compensatory in nature, with most of the USD 34 billion sum being composed of consumer relief and not monetary payments to agencies. Another possible explanation is that most of these cases were widely discussed by the media and the outcomes were surprisingly positive. The coefficient of the dummy variable regarding violation of sanctions is also positive and significant for all panels B in **Appendixes 17 to 19**. Some arguments might explain this: First, in such cases, criminal law is applied instead of civil law. However, all cases in the sample are settled either through non-prosecution agreements (most common) or guilty plea, which are most probably well received by investors. Second, breaching of economic sanctions mostly happens due to poor anti-money-laundering and counter-financing of terrorism (AML/CFT) compliance frameworks. In such cases, even if rare, banks might get into situations of getting their license revoked[8]. Third, as shown in Panel C **Appendix 6**, the average penalty for this type of misconduct is considerably larger when compared to other forms of misconduct in which criminal law is also applied. In fact, from all categories, the average penalty for violating sanctions is the third largest in value, only surpassed by penalties related to foreclosure abuses and misseling of financial products. As discovered before, larger settlements have a positive impact on banks' CARs. Due to these reasons, investors seem to be especially pleased if litigation of this particular category is settled, resulting in higher CARs.

7. Conclusions

This study intends to extend prior research on corporate misconduct in the financial sector, by examining settlement announcement events between GSIBs and regulators resulting in the conclusion of unsolved litigation for the period January 2010-February 2017. Due to lack of research on this particular topic, an overview of financial penalty trends is provided for the banks in the sample. To assess the impact of settlements on the stock market performance of banks an event study is conducted. Furthermore, with the intent of

[8] In a case involving Standard Chartered, the NYDFS threatened to strip the bank's New York license. See: http://www.dfs.ny.gov/about/ea/ea120806.pdf

explaining the determinants of ARs I apply a cross-sectional regression model with CARs as the dependent variable several bank-specific and settlement-specific characteristics as explanatory variables.

The event study results for the full sample show that the market reaction is significantly positive on the day a settlement is announced and for three different multi-day event windows ((-1, 1), (0, 1) and (-1, 0)). This might indicate that in some cases relevant information about the outcome of a case will surface before the public announcement, while other times this may not be true. Results for non-USA and USA bank sub-samples indicate that leakage of information only exists in non-USA banks, since the (-1, 0) event window mean CAR is proved to be significantly positive, while for USA banks this is not verified. Additionally, for USA banks the positive reaction from the market seems to occur on the day after the announcement. However, this might be due to the timing of the announcement (i.e. after the market is closed).

The cross-sectional analysis of CARs shows that the relative size of the penalty has a positive impact on the ARs. A reasonable explanation is that major settlements are usually widely covered by the media and there is great speculation around them. If the final outcome is better than expected this should be received as good news by investors. It also seems that less effective banks are penalized by the market and that banks with higher effective tax rates seem to experience larger positive CARs. Settlements with the FHFA appear to not please investors, as opposed to what's verified with private parties. Finally, regarding the impact of the type of misconduct, settlements involving foreclosure abuses and violation of sanctions are particularly well received by the market, resulting in higher positive ARs.

Overall, the results seem to confirm that investors are pleased with resolution of litigation through settlements. Different factors contribute to this: First, the settlement eliminates uncertainty about the case and ends further negative coverage by the media. Second, the terms of the settlement might be better than anticipated. Third, partial tax deductibility offsets to a certain degree the impact of the penalties. Fourth, the settlement is expected to lead to more responsible practices by the management and to an abolishment of erratic behaviors within the bank.

Some limitations of this study include the small number of banks being analyzed, the criteria for including an event in the sample and not considering the exact time of the announcements. For future research, based on the results obtained and results from prior research, as suggested by Gillet et al. (2010), by considering all the stages in litigation processes, creating an event-driven investment strategy that goes long when there are allegations of misconduct and the outcome is unknown might yield interesting results.

8. Appendix

Appendix 1

Benchmark indexes and datasets used per country.

Country	Market Model	Two-Index Model	Four-Factor Model
China	SSE 50	MSCI World Banks	Asia Pacific Daily
France	CAC 40	MSCI World Banks	European Daily
Germany	DAX 30	MSCI World Banks	European Daily
Italy	FTSE MIB	MSCI World Banks	European Daily
Japan	NIKKEI 225	MSCI World Banks	Japan Daily
Netherlands	AEX	MSCI World Banks	European Daily
Switzerland	SMI	MSCI World Banks	European Daily
USA	FTSE 100	MSCI World Banks	European Daily
U.K	S&P 500	MSCI World Banks	USA Daily

This table presents the benchmark indexes and datasets used by banks from a certain country for each return generating model.

Appendix 2

Variable definitions and data sources.

Variable	Definition	Source
CAR	Sum of abnormal returns for (-1, 1) window.	Datastream, own calc.
PEN	Ratio of penalty amount to total assets at FY-end prior to the penalty.	Worldscope, annual reports.
BTROA	Ratio of pre-tax income to total assets at FY-end prior to the penalty.	Worldscope, annual reports.
CAP	Ratio of common equity to total assets at FY-end prior to the penalty.	Worldscope, annual reports.
SIZE	Natural logarithm of total assets at FY-end prior to the penalty.	Worldscope, annual reports.
LIQ	Ratio of total loans to total deposits at FY-end prior to the penalty.	Worldscope, annual reports.
CREDITQ	Ratio of allowance for loan losses to total assets at FY-end prior to the penalty.	Worldscope, annual reports.
PORTFR	Ratio of risk weighted assets to total assets at FY-end prior to the penalty.	Worldscope, annual reports.
SOLV	Tier 1 capital ratio at FY-end prior to the penalty.	Worldscope, annual reports.
EFF	Ratio of operating expenses to operating income at FY-end prior to the penalty.	Worldscope, annual reports.
TAX	Ratio of taxes paid to pre-tax income at FY-end prior to the penalty.	Worldscope, annual reports.
AGEN	Dummy variables indicating the agency with whom the settlement was reached.	Own elab.
CAT	Dummy variables indicating the misconduct category.	Own elab.

This table presents definitions and sources for all variables used in the empirical study.

Appendix 3

List of sample banks.

Banks		Country	# Banks
Agricultural Bank of China	Intesa Sanpaolo	China	1
Bank of America	JP Morgan Chase & Co	France	3
Barclays	Lloyds Banking Group	Germany	2
BNP Paribas	Mitsubishi UFJ Financial	Italy	1
Bank of New York Mellon	Mizuho FG	Japan	2
Citigroup	Morgan Stanley	Netherlands	1
Commerzbank	Royal Bank of Scotland	Switzerland	2
Crédit Agricole	Société Générale	United Kingdom	5
Credit Suisse	Standard Chartered	USA	8
Deutsche Bank	State Street Corporation	**Total**	25
Goldman Sachs	UBS Group		
HSBC	Wells Fargo & Company		
ING Bank			

This table presents all sample banks listed in alphabetical order and an overview of the total number of banks sorted by country.

Appendix 4

Number of events per bank.

Bank	# Events
Agricultural Bank of China	1
Bank of America	23
Barclays	8
BNP Paribas	1
Bank New York Mellon	2
Citigroup	13
Commerzbank	1
Crédit Agricole	3
Credit Suisse	6
Deutsche Bank	9
Goldman Sachs	5
HSBC	5
ING Bank	1
Intesa Sanpaolo	1
JP Morgan Chase & Co	21
Lloyds Banking Group	2
Mitsubishi UFJ Financial	2
Mizuho FG	1
Morgan Stanley	6
Royal Bank of Scotland	9
Société Générale	2
Standard Chartered	3
State Street Corporation	1
UBS Group	6
Wells Fargo & Company	9
Total	141

This table presents all sample banks listed in alphabetical order and the number of events per bank.

Appendix 5

Number of events per agency.

Agency	# Events
Banca d'Italia (BDI)	1
Consumer Financial Protection Bureau (CFT)	3
U.S Commodity Futures Trading Commission (CFTC)	3
U.S Department of Justice (DOJ)	24
European Commission (EC)	5
Financial Conduct Authority (FCA)	3
Federal Deposit Insurance Corporation (FDIC)	1
Federal Reserve (FED)	3
Federal Energy Regulatory Commission (FERC)	2
Federal Housing Finance Agency (FHFA)	17
Financial Crimes Enforcement Network (FINCEN)	1
Federal Trade Commission (FTC)	1
Joint	30
National Credit Union Administration (NCUA)	5
New York Department of Financial Services (NYDFS)	10
Office of the Comptroller of the Currency (OCC)	5
Private	13
Securities & Exchange Commission (SEC)	14
Total	141

This table presents all sample agencies listed in alphabetical order and the number of events per agency. Whenever there is more than one settlement with different agencies in the same day for the same bank, the "Joint" category is applied.

Appendix 6

Descriptive statistics of individual penalties per misconduct category for all banks in USD bn.

Panel A: # Penalties

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Compliance Violation	36	2	3	9	13	4	3	-	2
Consumer/Investor Protection Violation	18	-	3	6	2	1	3	1	2
Market Manipulation	47	-	6	14	10	8	5	3	1
Misseling Practices	60	3	8	4	14	16	6	7	2
Mortgage Abuses	13	-	2	-	-	7	4	-	-
Sanctions	15	-	-	6	2	2	4	-	1
Tax Offences	6	-	1	1	3	-	-	-	1

Panel B: Total amount

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Compliance Violation	12.88	0.63	0.72	2.54	5.90	0.92	1.92	-	0.26
Consumer/Investor Protection Violation	6.11	-	0.99	2.31	0.94	0.39	0.73	0.34	0.42
Market Manipulation	15.64	-	1.14	6.59	2.14	3.28	1.82	0.54	0.14
Misseling Practices	124.74	13.30	14.12	0.91	41.78	37.68	3.58	12.22	1.15
Mortgage Abuses	33.64	-	0.60	-	-	8.44	24.60	-	-
Sanctions	13.72	-	-	2.50	9.29	0.35	1.29	-	0.30
Tax Offences	3.39	-	0.12	0.10	2.62	-	-	-	0.55

Panel C: Average amount

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Compliance Violation	0.36	0.32	0.24	0.28	0.45	0.23	0.64	-	0.13
Consumer/Investor Protection Violation	0.34	-	0.33	0.38	0.47	0.39	0.24	0.34	0.21
Market Manipulation	0.33	-	0.19	0.47	0.21	0.41	0.36	0.18	0.14
Misseling Practices	2.08	4.43	1.77	0.23	2.98	2.35	0.60	1.75	0.58
Mortgage Abuses	2.59	-	0.30	-	-	1.21	6.15	-	-

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Sanctions	0.91	-	-	0.42	4.64	0.18	0.32	-	0.30
Tax Offences	0.56	-	0.12	0.10	0.87	-	-	-	0.55

Panel D: Maximum amount

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Compliance Violation	1.70	0.43	0.27	0.44	1.70	0.30	1.26	-	0.15
Consumer/Investor Protection Violation	0.75	-	0.42	0.73	0.75	0.39	0.37	0.34	0.31
Market Manipulation	0.98	-	0.37	0.93	0.31	0.98	0.70	0.23	0.14
Misseling Practices	16.65	7.20	5.00	0.33	16.65	13.00	2.43	8.50	0.60
Mortgage Abuses	11.80	-	0.47	-	-	2.89	11.80	-	-
Sanctions	8.97	-	-	0.65	8.97	0.25	0.62	-	0.30
Tax Offences	1.80	-	0.12	0.10	1.80	-	-	-	0.55

Panel E: Minimum amount

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Compliance Violation	0.11	0.21	0.22	0.11	0.25	0.20	0.17	-	0.11
Consumer/Investor Protection Violation	0.11	-	0.19	0.18	0.20	0.39	0.13	0.34	0.11
Market Manipulation	0.09	-	0.10	0.12	0.09	0.10	0.16	0.15	0.14
Misseling Practices	0.10	0.80	0.19	0.18	0.10	0.13	0.12	0.15	0.55
Mortgage Abuses	0.13	-	0.13	-	-	0.23	2.20	-	-
Sanctions	0.10	-	-	0.20	0.32	0.10	0.10	-	0.30
Tax Offences	0.10	-	0.12	0.10	0.10	-	-	-	0.55

This table presents descriptive statistics of individual financial penalties per misconduct category for the full sample. Panel A reports the number of events. Panel B reports the total amount. Panel C reports the average settlement. Panel D reports the maximum settlement. Panel E reports the minimum settlement. Results are reported for each year and for the full sample period. Results for 2017 only include two months (January and February).

Appendix 7

Descriptive statistics of individual penalties per misconduct category for non-USA banks in USD bn.

Panel A: # Penalties

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Compliance Violation	16	2	2	5	4	-	3	-	-
Consumer/Investor Protection Violation	3	-	-	1	1	-	1	-	-
Market Manipulation	34	-	2	12	8	6	5	1	-
Misseling Practices	16	2	2	1	5	3	2	1	-
Mortgage Abuses	3	-	2	-	-	1	-	-	-
Sanctions	15	-	-	6	2	2	4	-	1
Tax Offences	6	-	1	1	3	-	-	-	1

Panel B: Total amount

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Compliance Violation	5.87	0.63	0.45	1.51	1.36	-	1.92	-	-
Consumer/Investor Protection Violation	0.50	-	-	0.18	0.20	-	0.13	-	-
Market Manipulation	11.60	-	0.23	5.11	1.52	2.77	1.82	0.16	-
Misseling Practices	20.31	12.50	2.12	0.33	1.94	2.96	0.32	0.15	-
Mortgage Abuses	0.85	-	0.60	-	-	0.25	-	-	-
Sanctions	13.72	-	-	2.50	9.29	0.35	1.29	-	0.30
Tax Offences	3.39	-	0.12	0.10	2.62	-	-	-	0.55

Panel C: Average amount

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Compliance Violation	0.37	0.32	0.23	0.30	0.34	-	0.64	-	-
Consumer/Investor Protection Violation	0.17	-	-	0.18	0.20	-	0.13	-	-
Market Manipulation	0.34	-	0.11	0.43	0.19	0.46	0.36	0.16	-
Misseling Practices	1.27	6.25	1.06	0.33	0.39	0.99	0.16	0.15	-
Mortgage Abuses	0.28	-	0.30	-	-	0.25	-	-	-

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Sanctions	0.91	-	-	0.42	4.64	0.18	0.32	-	0.30
Tax Offences	0.56	-	0.12	0.10	0.87	-	-	-	0.55

Panel D: Maximum amount

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Compliance Violation	1.26	0.43	0.24	0.44	0.37	-	1.26	-	-
Consumer/Investor Protection Violation	0.20	-	-	0.18	0.20	-	0.13	-	-
Market Manipulation	0.98	-	0.13	0.80	0.29	0.98	0.70	0.16	-
Misseling Practices	7.20	7.20	1.10	0.33	0.89	1.93	0.20	0.15	-
Mortgage Abuses	0.47	-	0.47	-	-	0.25	-	-	-
Sanctions	8.97	-	-	0.65	8.97	0.25	0.62	-	0.30
Tax Offences	1.80	-	0.12	0.10	1.80	-	-	-	0.55

Panel E: Minimum amount

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Compliance Violation	0.11	0.21	0.22	0.11	0.30	-	0.17	-	-
Consumer/Investor Protection Violation	0.13	-	-	0.18	0.20	-	0.13	-	-
Market Manipulation	0.09	-	0.10	0.12	0.09	0.14	0.16	0.16	-
Misseling Practices	0.10	5.30	1.02	0.33	0.10	0.15	0.12	0.15	-
Mortgage Abuses	0.13	-	0.13	-	-	0.25	-	-	-
Sanctions	0.10	-	-	0.20	0.32	0.10	0.10	-	0.30
Tax Offences	0.10	-	0.12	0.10	0.10	-	-	-	0.55

This table presents descriptive statistics of individual financial penalties per misconduct category for non-USA banks. Panel A reports the number of events. Panel B reports the total amount. Panel C reports the average settlement. Panel D reports the maximum settlement. Panel E reports the minimum settlement. Results are reported for each year and for the full sample period. Results for 2017 only include two months (January and February).

Appendix 8

Descriptive statistics of individual penalties per misconduct category for USA banks in USD bn.

Panel A: # Penalties

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Compliance Violation	20	-	-	4	9	4	-	-	2
Consumer/Investor Protection Violation	15	-	3	5	1	1	2	1	2
Market Manipulation	13	-	4	2	2	2	-	2	1
Misseling Practices	44	1	6	3	9	13	4	6	2
Mortgage Abuses	10	-	-	-	-	6	4	-	-
Sanctions	-	-	-	-	-	-	-	-	-
Tax Offences	-	-	-	-	-	-	-	-	-

Panel B: Total amount

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Compliance Violation	7.01	-	0.27	1.03	4.54	0.92	-	-	0.26
Consumer/Investor Protection Violation	5.61	-	0.99	2.13	0.75	0.39	0.60	0.34	0.42
Market Manipulation	4.04	-	0.92	1.48	0.62	0.51	-	0.38	0.14
Misseling Practices	104.43	0.80	12.01	0.59	39.84	34.71	3.26	12.07	1.15
Mortgage Abuses	32.79	-	-	-	-	8.19	24.60	-	-
Sanctions	-	-	-	-	-	-	-	-	-
Tax Offences	-	-	-	-	-	-	-	-	-

Panel C: Average amount

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Compliance Violation	0.35	-	0.27	0.26	0.50	0.23	-	-	0.13
Consumer/Investor Protection Violation	0.37	-	0.33	0.43	0.75	0.39	0.30	0.34	0.21
Market Manipulation	0.31	-	0.23	0.74	0.31	0.26	-	0.19	0.14
Misseling Practices	2.37	0.80	2.00	0.20	4.43	2.67	0.82	2.01	0.58
Mortgage Abuses	3.28	-	-	-	-	1.37	6.15	-	-

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Sanctions	-	-	-	-	-	-	-	-	-
Tax Offences	-	-	-	-	-	-	-	-	-

Panel D: Maximum amount

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Compliance Violation	1.70	-	0.27	0.34	1.70	0.30	-	-	0.15
Consumer/Investor Protection Violation	0.75	-	0.42	0.73	0.75	0.39	0.37	0.34	0.31
Market Manipulation	0.93	-	0.37	0.93	0.31	0.41	-	0.23	0.14
Misseling Practices	16.65	0.80	5.00	0.23	16.65	13.00	2.43	8.50	0.60
Mortgage Abuses	11.80	-	-	-	-	2.89	11.80	-	-
Sanctions	-	-	-	-	-	-	-	-	-
Tax Offences	-	-	-	-	-	-	-	-	-

Panel E: Minimum amount

Category	Total	2017	2016	2015	2014	2013	2012	2011	2010
Compliance Violation	0.11	-	0.27	0.14	0.25	0.20	-	-	0.11
Consumer/Investor Protection Violation	0.11	-	0.19	0.19	0.75	0.39	0.23	0.34	0.11
Market Manipulation	0.10	-	0.12	0.55	0.31	0.10	-	0.15	0.14
Misseling Practices	0.13	0.80	0.19	0.18	0.28	0.13	0.16	0.15	0.55
Mortgage Abuses	0.23	-	-	-	-	0.23	2.20	-	-
Sanctions	-	-	-	-	-	-	-	-	-
Tax Offences	-	-	-	-	-	-	-	-	-

This table presents descriptive statistics of individual financial penalties per misconduct category for USA banks. Panel A reports the number of events. Panel B reports the total amount. Panel C reports the average settlement. Panel D reports the maximum settlement. Panel E reports the minimum settlement. Results are reported for each year and for the full sample period. Results for 2017 only include two months (January and February).

Appendix 9

Descriptive statistics of individual penalties per agency in USD bn.

Panel A: # Penalties

Agency	Total	2017	2016	2015	2014	2013	2012	2011	2010
Banca d'Italia (BDI)	1	-	1	-	-	-	-	-	-
Consumer Financial Protection Bureau (CFPB)	5	-	1	2	1	1	-	-	-
U.S Commodity Futures Trading Commission (CFTC)	17	-	3	3	7	2	2	-	-
U.S Department of Justice (DOJ)	40	2	4	10	7	1	9	4	3
European Commission (EC)	5	-	2	-	-	3	-	-	-
Financial Conduct Authority (FCA)	15	1	-	5	6	2	1	-	-
Federal Deposit Insurance Corporation (FDIC)	1	-	-	1	-	-	-	-	-
Federal Reserve (FED)	14	-	1	7	1	3	2	-	-
Federal Energy Regulatory Commission (FERC)	2	-	-	-	-	2	-	-	-
Federal Housing Finance Agency (FHFA)	19	-	-	-	8	9	-	2	-
Financial Crimes Enforcement Network (FINCEN)	1	-	-	-	-	-	-	-	1
Federal Trade Commission (FTC)	1	-	-	-	-	-	-	-	1
Joint	6	-	1	-	1	-	4	-	-
National Credit Union Administration (NCUA)	5	-	1	2	-	1	-	1	-
New York Department of Financial Services (NYDFS)	15	1	2	6	3	2	1	-	-
Office of the Comptroller of the Currency (OCC)	11	-	-	-	4	6	1	-	-
Private	18	1	4	2	3	3	2	2	1
Securities & Exchange Commission (SEC)	18	-	3	2	2	3	3	2	3
Swiss Financial Market Supervisory Authority (FINMA)	1	-	-	-	1	-	-	-	-

Panel B: Total amount

Agency	Total	2017	2016	2015	2014	2013	2012	2011	2010
Banca d'Italia (BDI)	0.12	-	0.12	-	-	-	-	-	-
Consumer Financial Protection Bureau (CFPB)	2.24	-	0.19	0.92	0.75	0.39	-	-	-
U.S Commodity Futures Trading Commission (CFTC)	5.05	-	0.55	1.32	1.86	0.43	0.90	-	-

Agency	Total	2017	2016	2015	2014	2013	2012	2011	2010
U.S Department of Justice (DOJ)	74.29	12.50	9.87	5.33	28.00	13.00	3.73	0.87	0.99
European Commission (EC)	2.32	-	0.50	-	-	1.82	-	-	-
Financial Conduct Authority (FCA)	4.02	0.21	-	1.26	1.95	0.36	0.26	-	-
Federal Deposit Insurance Corporation (FDIC)	0.14	-	-	0.14	-	-	-	-	-
Federal Reserve (FED)	3.30	-	0.13	2.05	0.10	0.76	0.27	-	-
Federal Energy Regulatory Commission (FERC)	0.90	-	-	-	-	0.90	-	-	-
Federal Housing Finance Agency (FHFA)	35.94	-	-	-	15.64	17.49	-	2.82	-
Financial Crimes Enforcement Network (FINCEN)	0.11	-	-	-	-	-	-	-	0.11
Federal Trade Commission (FTC)	0.11	-	-	-	-	-	-	-	0.11
Joint	33.67	-	0.10	-	8.97	-	24.60	-	-
National Credit Union Administration (NCUA)	1.96	-	1.10	0.55	-	0.17	-	0.15	-
New York Department of Financial Services (NYDFS)	5.47	0.43	0.45	2.58	1.33	0.35	0.34	-	-
Office of the Comptroller of the Currency (OCC)	9.99	-	-	-	1.30	8.19	0.50	-	-
Private	25.85	0.80	3.62	0.32	2.15	6.74	2.81	8.82	0.60
Securities & Exchange Commission (SEC)	4.51	-	1.07	0.49	0.47	0.49	0.55	0.44	1.01
Swiss Financial Market Supervisory Authority (FINMA)	0.14	-	-	-	0.14	-	-	-	-

Panel C: Average amount

Agency	Total	2017	2016	2015	2014	2013	2012	2011	2010
Banca d'Italia (BDI)	0.12	-	0.12	-	-	-	-	-	-
Consumer Financial Protection Bureau (CFPB)	0.45	-	0.19	0.46	0.75	0.39	-	-	-
U.S Commodity Futures Trading Commission (CFTC)	0.30	-	0.18	0.44	0.27	0.21	0.45	-	-
U.S Department of Justice (DOJ)	1.86	6.25	2.47	0.53	4.00	13.00	0.41	0.22	0.33
European Commission (EC)	0.46	-	0.25	-	-	0.61	-	-	-
Financial Conduct Authority (FCA)	0.27	0.21	-	0.25	0.32	0.18	0.26	-	-
Federal Deposit Insurance Corporation (FDIC)	0.14	-	-	0.14	-	-	-	-	-
Federal Reserve (FED)	0.24	-	0.13	0.29	0.10	0.25	0.13	-	-
Federal Energy Regulatory Commission (FERC)	0.45	-	-	-	-	0.45	-	-	-

Agency	Total	2017	2016	2015	2014	2013	2012	2011	2010
Financial Crimes Enforcement Network (FINCEN)	0.11	-	-	-	-	-	-	-	0.11
Federal Trade Commission (FTC)	0.11	-	-	-	-	-	-	-	0.11
Joint	5.61	-	0.10	-	8.97	-	6.15	-	-
National Credit Union Administration (NCUA)	0.39	-	1.10	0.28	-	0.17	-	0.15	-
New York Department of Financial Services (NYDFS)	0.36	0.43	0.23	0.43	0.44	0.18	0.34	-	-
Office of the Comptroller of the Currency (OCC)	0.91	-	-	-	0.33	1.36	0.50	-	-
Private	1.44	0.80	0.91	0.16	0.72	2.25	1.40	4.41	0.60
Securities & Exchange Commission (SEC)	0.25	-	0.36	0.24	0.24	0.16	0.18	0.22	0.34
Swiss Financial Market Supervisory Authority (FINMA)	0.14	-	-	-	0.14	-	-	-	-

Panel D: Maximum amount

Agency	Total	2017	2016	2015	2014	2013	2012	2011	2010
Banca d'Italia (BDI)	0.12	-	0.12	-	-	-	-	-	-
Consumer Financial Protection Bureau (CFPB)	0.75	-	0.19	0.73	0.75	0.39	-	-	-
U.S Commodity Futures Trading Commission (CFTC)	0.80	-	0.25	0.80	0.31	0.33	0.70	-	-
U.S Department of Justice (DOJ)	16.65	7.20	5.00	0.93	16.65	13.00	1.26	0.34	0.55
European Commission (EC)	0.98	-	0.37	-	-	0.98	-	-	-
Financial Conduct Authority (FCA)	0.44	0.21	-	0.44	0.37	0.22	0.26	-	-
Federal Deposit Insurance Corporation (FDIC)	0.14	-	-	0.14	-	-	-	-	-
Federal Reserve (FED)	0.34	-	0.13	0.34	0.10	0.33	0.17	-	-
Federal Energy Regulatory Commission (FERC)	0.49	-	-	-	-	0.49	-	-	-
Federal Housing Finance Agency (FHFA)	10.35	-	-	-	9.30	10.35	-	1.52	-
Financial Crimes Enforcement Network (FINCEN)	0.11	-	-	-	-	-	-	-	0.11
Federal Trade Commission (FTC)	0.11	-	-	-	-	-	-	-	0.11
Joint	11.80	-	0.10	-	8.97	-	11.80	-	-
National Credit Union Administration (NCUA)	1.10	-	1.10	0.33	-	0.17	-	0.15	-
New York Department of Financial Services (NYDFS)	0.72	0.43	0.24	0.61	0.72	0.25	0.34	-	-
Office of the Comptroller of the Currency (OCC)	2.89	-	-	-	0.35	2.89	0.50	-	-

Agency	Total	2017	2016	2015	2014	2013	2012	2011	2010
Private	8.50	0.80	1.42	0.18	0.95	4.50	2.43	8.50	0.60
Securities & Exchange Commission (SEC)	0.55	-	0.42	0.31	0.28	0.20	0.30	0.29	0.55
Swiss Financial Market Supervisory Authority (FINMA)	0.14	-	-	-	0.14	-	-	-	-

Panel E: Minimum amount

Agency	Total	2017	2016	2015	2014	2013	2012	2011	2010
Banca d'Italia (BDI)	0.12	-	0.12	-	-	-	-	-	-
Consumer Financial Protection Bureau (CFPB)	0.19	-	0.19	0.19	0.75	0.39	-	-	-
U.S Commodity Futures Trading Commission (CFTC)	0.10	-	0.12	0.12	0.11	0.10	0.20	-	-
U.S Department of Justice (DOJ)	0.09	5.30	0.47	0.10	0.09	13.00	0.16	0.15	0.14
European Commission (EC)	0.13	-	0.13	-	-	0.31	-	-	-
Financial Conduct Authority (FCA)	0.11	0.21	-	0.11	0.18	0.14	0.26	-	-
Federal Deposit Insurance Corporation (FDIC)	0.14	-	-	0.14	-	-	-	-	-
Federal Reserve (FED)	0.10	-	0.13	0.20	0.10	0.20	0.10	-	-
Federal Energy Regulatory Commission (FERC)	0.41	-	-	-	-	0.41	-	-	-
Federal Housing Finance Agency (FHFA)	0.10	-	-	-	0.10	0.40	-	1.30	-
Financial Crimes Enforcement Network (FINCEN)	0.11	-	-	-	-	-	-	-	0.11
Federal Trade Commission (FTC)	0.11	-	-	-	-	-	-	-	0.11
Joint	0.10	-	0.10	-	8.97	-	2.20	-	-
National Credit Union Administration (NCUA)	0.15	-	1.10	0.23	-	0.17	-	0.15	-
New York Department of Financial Services (NYDFS)	0.10	0.43	0.22	0.15	0.30	0.10	0.34	-	-
Office of the Comptroller of the Currency (OCC)	0.25	-	-	-	0.25	0.25	0.50	-	-
Private	0.14	0.80	0.19	0.14	0.55	0.50	0.38	0.32	0.60
Securities & Exchange Commission (SEC)	0.12	-	0.27	0.18	0.20	0.13	0.12	0.15	0.15
Swiss Financial Market Supervisory Authority (FINMA)	0.14	-	-	-	0.14	-	-	-	-

This table presents descriptive statistics of individual financial penalties per agency for the full sample. Panel A reports the number of events. Panel B reports the total amount. Panel C reports the average settlement. Panel D reports the maximum settlement. Panel E reports the minimum settlement. Results are reported for each year and for the full sample period. Results for 2017 only include two months (January and February).

Appendix 10

Descriptive statistics of individual penalties per agency and misconduct category in USD bn.

Panel A: # Penalties

Agency/Misconduct category	COMPV	CIPBV	MARKM	MISSP	MORTA	SANC	TAXO
Consumer Financial Protection Bureau (CFPB)	-	5	-	-	-	-	-
U.S Commodity Futures Trading Commission (CFTC)	1	-	16	-	-	-	-
U.S Department of Justice (DOJ)	2	4	14	11	1	5	3
European Commission (EC)	-	-	5	-	-	-	-
Financial Conduct Authority (FCA)	9	2	4	-	-	-	-
Federal Reserve (FED)	8	-	-	-	3	2	1
Federal Housing Finance Agency (FHFA)	-	-	-	19	-	-	-
Joint	-	-	1	-	4	1	-
National Credit Union Administration (NCUA)	-	-	-	5	-	-	-
New York Department of Financial Services (NYDFS)	4	-	3	-	-	7	1
Office of the Comptroller of the Currency (OCC)	6	-	-	-	5	-	-
Private	1	-	1	16	-	-	-
Securities & Exchange Commission (SEC)	3	6	-	9	-	-	-
Other	2	1	3	-	-	-	1

Panel B: Total amount

Agency/Misconduct category	COMPV	CIPBV	MARKM	MISSP	MORTA	SANC	TAXO
Consumer Financial Protection Bureau (CFPB)	-	2.24	-	-	-	-	-
U.S Commodity Futures Trading Commission (CFTC)	0.28	-	4.77	-	-	-	-
U.S Department of Justice (DOJ)	2.96	1.65	5.13	59.52	0.47	2.10	2.45
European Commission (EC)	-	-	2.32	-	-	-	-
Financial Conduct Authority (FCA)	2.75	0.37	0.91	-	-	-	-
Federal Reserve (FED)	2.21	-	-	-	0.69	0.30	0.10
Federal Housing Finance Agency (FHFA)	-	-	-	35.94	-	-	-
Joint	-	-	0.10	-	24.60	8.97	-
National Credit Union Administration (NCUA)	-	-	-	1.96	-	-	-
New York Department of Financial Services (NYDFS)	1.18	-	1.24	-	-	2.35	0.72

Agency/Misconduct category	COMPV	CIPBV	MARKM	MISSP	MORTA	SANC	TAXO
Office of the Comptroller of the Currency (OCC)	2.10	-	-	-	7.89	-	-
Private	0.55	-	0.14	25.16	-	-	-
Securities & Exchange Commission (SEC)	0.62	1.75	-	2.15	-	-	-
Other	0.25	0.11	1.04	-	-	-	0.12

Panel C: Average amount

Agency/Misconduct category	COMPV	CIPBV	MARKM	MISSP	MORTA	SANC	TAXO
Consumer Financial Protection Bureau (CFPB)	-	0.45	-	-	-	-	-
U.S Commodity Futures Trading Commission (CFTC)	0.28	-	0.30	-	-	-	-
U.S Department of Justice (DOJ)	1.48	0.41	0.37	5.41	0.47	0.42	0.82
European Commission (EC)	-	-	0.46	-	-	-	-
Financial Conduct Authority (FCA)	0.31	0.18	0.23	-	-	-	-
Federal Reserve (FED)	0.28	-	-	-	0.23	0.15	0.10
Federal Housing Finance Agency (FHFA)	-	-	-	1.89	-	-	-
Joint	-	-	0.10	-	6.15	8.97	-
National Credit Union Administration (NCUA)	-	-	-	0.39	-	-	-
New York Department of Financial Services (NYDFS)	0.29	-	0.41	-	-	0.34	0.72
Office of the Comptroller of the Currency (OCC)	0.35	-	-	-	1.58	-	-
Private	0.55	-	0.14	1.57	-	-	-
Securities & Exchange Commission (SEC)	0.21	0.29	-	0.24	-	-	-
Other	0.12	0.11	0.35	-	-	-	0.12

Panel D: Maximum Amount

Agency/Misconduct category	COMPV	CIPBV	MARKM	MISSP	MORTA	SANC	TAXO
Consumer Financial Protection Bureau (CFPB)	-	0.75	-	-	-	-	-
U.S Commodity Futures Trading Commission (CFTC)	0.28	-	0.80	-	-	-	-
U.S Department of Justice (DOJ)	1.70	0.71	0.93	16.65	0.47	0.65	1.80
European Commission (EC)	-	-	0.98	-	-	-	-
Financial Conduct Authority (FCA)	0.44	0.19	0.34	-	-	-	-
Federal Reserve (FED)	0.34	-	-	-	0.33	0.20	0.10

Agency/Misconduct category	COMPV	CIPBV	MARKM	MISSP	MORTA	SANC	TAXO
Federal Housing Finance Agency (FHFA)	-	-	-	10.35	-	-	-
Joint	-	-	0.10	-	11.80	8.97	-
National Credit Union Administration (NCUA)	-	-	-	1.10	-	-	-
New York Department of Financial Services (NYDFS)	0.43	-	0.60	-	-	0.61	0.72
Office of the Comptroller of the Currency (OCC)	0.50	-	-	-	2.89	-	-
Private	0.55	-	0.14	8.50	-	-	-
Securities & Exchange Commission (SEC)	0.27	0.42	-	0.55	-	-	-
Other	0.14	0.19	0.49	-	-	-	0.12

Panel E: Minimum Amount

Agency/Misconduct category	COMPV	CIPBV	MARKM	MISSP	MORTA	SANC	TAXO
Consumer Financial Protection Bureau (CFPB)	-	-	-	-	-	-	0.12
U.S Commodity Futures Trading Commission (CFTC)	0.28	-	0.10	-	-	-	-
U.S Department of Justice (DOJ)	1.26	0.23	0.09	0.16	0.47	0.23	0.10
European Commission (EC)	-	-	0.13	-	-	-	-
Financial Conduct Authority (FCA)	0.11	0.18	0.14	-	-	-	-
Federal Reserve (FED)	0.17	-	-	-	0.13	0.10	0.10
Federal Housing Finance Agency (FHFA)	-	-	-	0.10	-	-	-
Joint	-	-	0.10	-	2.20	8.97	-
National Credit Union Administration (NCUA)	-	-	-	0.15	-	-	-
New York Department of Financial Services (NYDFS)	0.22	-	0.15	-	-	0.10	0.72
Office of the Comptroller of the Currency (OCC)	0.25	-	-	-	0.25	-	-
Private	0.55	-	0.14	0.18	-	-	-
Securities & Exchange Commission (SEC)	0.15	0.13	-	0.12	-	-	-
Other	0.11	0.11	-	-	-	-	0.12

This table presents descriptive statistics of individual financial penalties per agency and misconduct type for the full sample. Panel A reports the number of events. Panel B reports the total amount. Panel C reports the average settlement. Panel D reports the maximum settlement. Panel E reports the minimum settlement. COMPV stands for *Compliance Violation*. CIPV stands for *Consumer/Investor Protection Violation*. MARKM stands for *Market Manipulation*. MISSP stands for *Misseling Practices*. MORTA stands for *Mortgage Abuses*. SANC stands for *Sanctions*. TAXO stands for *Tax Offences*.

Appendix 11

List of events included in the sample.

Event Date	Bank	Penalty (USD bn)	Misconduct Type	Agency
04-11-2016	Agricultural Bank of China	0.22	COMPV	NYDFS
28-06-2011	Bank of America	8.50	MISSP	PRIVATE
20-05-2015	Bank of America	0.21	COMPV	FED
03-05-2016	Bank of America	0.19	MISSP	PRIVATE
29-04-2015	Bank of America	0.18	MISSP	PRIVATE
12-11-2014	Bank of America	0.25	COMPV	OCC
21-08-2014	Bank of America	16.65	MISSP	DOJ
09-04-2014	Bank of America	0.75	CIPV	CFPB
26-03-2014	Bank of America	9.30	MISSP	FHFA
12-12-2013	Bank of America	0.13	MISSP	SEC
06-12-2013	Bank of America	0.50	MISSP	PRIVATE
02-12-2013	Bank of America	0.40	MISSP	FHFA
06-05-2013	Bank of America	1.74	MISSP	PRIVATE
02-04-2013	Bank of America	0.17	MISSP	NCUA
07-01-2013	Bank of America	13.24	VAR	JOINT
28-09-2012	Bank of America	2.43	MISSP	PRIVATE
13-09-2012	Bank of America	0.37	CIPV	DOJ
09-02-2012	Bank of America	11.80	MORTA	JOINT
21-12-2011	Bank of America	0.34	CIPV	DOJ
06-12-2011	Bank of America	0.32	MISSP	PRIVATE
03-01-2011	Bank of America	2.82	MISSP	FHFA
07-12-2010	Bank of America	0.14	MARKM	DOJ
07-06-2010	Bank of America	0.11	CIPV	FTC
02-08-2010	Bank of America	0.60	MISSP	PRIVATE
08-08-2016	Barclays	0.10	MARKM	JOINT
26-11-2015	Barclays	0.11	COMPV	FCA
18-11-2015	Barclays	0.15	MARKM	NYDFS
19-10-2015	Barclays	0.33	MISSP	NCUA
20-05-2015	Barclays	2.50	VAR	JOINT
24-04-2014	Barclays	0.28	MISSP	FHFA
16-07-2013	Barclays	0.49	MARKM	FERC
18-08-2010	Barclays	0.30	SANC	DOJ
30-06-2014	BNP Paribas	8.97	SANC	JOINT
19-05-2015	BNY Mellon	0.71	CIPV	DOJ
15-05-2015	BNY Mellon	0.19	CIPV	FCA
25-05-2016	Citigroup	0.43	MARKM	CFTC
17-08-2015	Citigroup	0.18	MISSP	SEC
22-07-2015	Citigroup	0.14	COMPV	FDIC
21-07-2015	Citigroup	0.73	CIPV	CFPB
20-05-2015	Citigroup	1.27	VAR	JOINT
12-11-2014	Citigroup	1.02	VAR	JOINT
14-07-2014	Citigroup	7.00	MISSP	DOJ
25-09-2013	Citigroup	0.40	MISSP	FHFA
01-07-2013	Citigroup	0.97	MISSP	FHFA
07-01-2013	Citigroup	0.80	MORTA	OCC
15-02-2012	Citigroup	0.16	MISSP	DOJ
09-02-2012	Citigroup	2.20	MORTA	JOINT

Event Date	Bank	Penalty (USD bn)	Misconduct Type	Agency
19-10-2011	Citigroup	0.29	MISSP	SEC
12-03-2015	Commerzbank	1.46	SANC	JOINT
07-12-2016	Crédit Agricole	0.13	MARKM	EC
15-12-2015	Crédit Agricole	0.10	TAXO	DOJ
20-10-2015	Crédit Agricole	0.79	SANC	JOINT
18-01-2017	Credit Suisse	5.30	MISSP	DOJ
21-10-2016	Credit Suisse	0.12	TAXO	BDI
19-05-2014	Credit Suisse	2.62	TAXO	JOINT
21-03-2014	Credit Suisse	0.89	MISSP	FHFA
21-02-2014	Credit Suisse	0.20	CIPV	SEC
16-11-2012	Credit Suisse	0.12	MISSP	SEC
30-01-2017	Deutsche Bank	0.63	COMPV	JOINT
17-01-2017	Deutsche Bank	7.20	MISSP	DOJ
04-11-2015	Deutsche Bank	0.26	SANC	NYDFS
23-04-2015	Deutsche Bank	2.52	MARKM	JOINT
20-12-2013	Deutsche Bank	1.93	MISSP	FHFA
04-12-2013	Deutsche Bank	0.98	MARKM	EC
10-05-2012	Deutsche Bank	0.20	MISSP	DOJ
14-11-2011	Deutsche Bank	0.15	MISSP	NCUA
21-12-2010	Deutsche Bank	0.55	TAXO	DOJ
21-12-2016	Goldman Sachs	0.12	MARKM	CFTC
11-04-2016	Goldman Sachs	5.00	MISSP	DOJ
22-08-2014	Goldman Sachs	3.15	MISSP	FHFA
16-01-2013	Goldman Sachs	0.33	MORTA	FED
15-07-2010	Goldman Sachs	0.55	MISSP	SEC
05-02-2016	HSBC	0.60	MORTA	JOINT
12-09-2014	HSBC	0.55	MISSP	FHFA
12-11-2014	HSBC	0.62	VAR	JOINT
18-01-2013	HSBC	0.25	MORTA	OCC
11-12-2012	HSBC	1.92	COMPV	JOINT
12-06-2012	ING Bank	0.62	SANC	DOJ
15-12-2016	Intesa Sanpaolo	0.24	COMPV	NYDFS
01-02-2017	JP Morgan & Chase	0.80	MISSP	PRIVATE
07-12-2016	JP Morgan & Chase	0.37	MARKM	EC
17-11-2016	JP Morgan & Chase	0.27	CIPV	SEC
25-01-2016	JP Morgan & Chase	2.42	MISSP	PRIVATE
18-12-2015	JP Morgan & Chase	0.31	CIPV	SEC
08-07-2015	JP Morgan & Chase	0.19	CIPV	CFPB
20-05-2015	JP Morgan & Chase	0.89	VAR	JOINT
12-11-2014	JP Morgan & Chase	1.01	VAR	JOINT
04-02-2014	JP Morgan & Chase	0.61	MISSP	DOJ
07-01-2014	JP Morgan & Chase	2.60	COMPV	JOINT
19-11-2013	JP Morgan & Chase	13.00	MISSP	DOJ
15-11-2013	JP Morgan & Chase	4.50	MISSP	PRIVATE
25-10-2013	JP Morgan & Chase	1.10	MISSP	FHFA
16-10-2013	JP Morgan & Chase	0.10	MARKM	CFTC
19-09-2013	JP Morgan & Chase	1.31	COMPV	JOINT
30-07-2013	JP Morgan & Chase	0.41	MARKM	FERC
07-01-2013	JP Morgan & Chase	1.96	MORTA	OCC
16-11-2012	JP Morgan & Chase	0.30	MISSP	SEC

Event Date	Bank	Penalty (USD bn)	Misconduct Type	Agency
09-02-2012	JP Morgan & Chase	5.30	MORTA	JOINT
07-07-2011	JP Morgan & Chase	0.23	MARKM	DOJ
21-06-2011	JP Morgan & Chase	0.15	MISSP	SEC
05-06-2015	Lloyds Banking Group	0.18	CIPV	FCA
28-07-2014	Lloyds Banking Group	0.37	MARKM	JOINT
18-11-2014	Mitsubishi UFJ Financial	0.32	SANC	NYDFS
20-06-2013	Mitsubishi UFJ Financial	0.25	SANC	NYDFS
18-07-2012	Mizuho FG	0.13	CIPV	SEC
11-02-2016	Morgan Stanley	3.20	MISSP	DOJ
10-12-2015	Morgan Stanley	0.23	MISSP	NCUA
15-09-2014	Morgan Stanley	0.28	COMPV	CFTC
24-07-2014	Morgan Stanley	0.28	MISSP	SEC
07-02-2014	Morgan Stanley	1.25	MISSP	FHFA
16-01-2013	Morgan Stanley	0.23	MORTA	FED
05-12-2016	Royal Bank of Scotland	1.02	MISSP	PRIVATE
27-09-2016	Royal Bank of Scotland	1.10	MISSP	NCUA
20-05-2015	Royal Bank of Scotland	0.67	VAR	JOINT
12-11-2014	Royal Bank of Scotland	0.63	VAR	JOINT
19-06-2014	Royal Bank of Scotland	0.10	MISSP	FHFA
06-01-2014	Royal Bank of Scotland	0.15	MARKM	DOJ
04-12-2013	Royal Bank of Scotland	0.53	MARKM	EC
07-11-2013	Royal Bank of Scotland	0.15	MISSP	SEC
06-02-2013	Royal Bank of Scotland	0.46	MARKM	JOINT
27-02-2014	Société Générale	0.12	MISSP	FHFA
04-12-2013	Société Générale	0.31	MARKM	EC
19-08-2014	Standard Chartered	0.30	COMPV	NYDFS
10-12-2012	Standard Chartered	0.33	SANC	JOINT
14-08-2012	Standard Chartered	0.34	SANC	NYDFS
04-02-2010	State Street Corporation	0.31	CIPV	SEC
20-05-2015	UBS Group	0.55	VAR	JOINT
13-03-2015	UBS Group	0.14	MARKM	PRIVATE
12-11-2014	UBS Group	0.80	VAR	JOINT
25-07-2013	UBS Group	0.89	MISSP	FHFA
19-12-2012	UBS Group	1.46	MARKM	JOINT
04-05-2011	UBS Group	0.16	MARKM	DOJ
08-09-2016	Wells Fargo & Company	0.19	CIPV	CFPB
08-04-2016	Wells Fargo & Company	1.20	MISSP	DOJ
30-12-2013	Wells Fargo & Company	0.59	MISSP	FHFA
27-09-2013	Wells Fargo & Company	0.87	MISSP	FHFA
07-01-2013	Wells Fargo & Company	1.99	MORTA	OCC
12-07-2012	Wells Fargo & Company	0.23	CIPV	DOJ
09-02-2012	Wells Fargo & Company	5.30	MORTA	JOINT
08-12-2011	Wells Fargo & Company	0.15	MARKM	DOJ
17-03-2010	Wells Fargo & Company	0.11	COMPV	FINCEN

This table presents events included in the sample. First column reports the event date. Second column reports the bank. Third column reports the penalty for each event. Fourth column reports the misconduct category. Fifth column reports the agency imposing the financial penalty (see **Appendix 4**). COMPV stands for *Compliance Violation*. CIPV stands for *Consumer/Investor Protection Violation*. MARKM stands for *Market Manipulation*. MISSP stands for *Misseling Practices*. MORTA stands for *Mortgage Abuses*. SANC stands for *Sanctions*. TAXO stands for *Tax Offences*. VAR stands for *Varied*.

Appendix 12

Cumulative abnormal returns following the resolution of litigation using Jaffe's (1974) approach.

Panel A: Market model				
Observations	122	122	122	122
Window	(0)	(-1,1)	(-1,0)	(0,1)
CAAR	0.0030	0.0074	0.0047	0.0057
Calendar-time test	2.77***	3.77***	2.96***	3.61***
Panel B: Two-index model				
Observations	122	122	122	122
Window	(0)	(-1,1)	(-1,0)	(0,1)
CAAR	0.0026	0.0071	0.0044	0.0052
Calendar-time test	2.60***	3.63***	2.88***	3.41***
Panel C: Four-factor model				
Observations	122	122	122	122
Window	(0)	(-1,1)	(-1,0)	(0,1)
CAAR	0.0030	0.0061	0.0039	0.0051
Calendar-time test	3.42***	3.80***	3.00***	4.07***

This table presents the CAARs for all banks following the portfolio approach of Jaffe (1974). Panel A reports the results based on the market model abnormal returns, Panel B shows the results based on the two-index model abnormal returns, and Panel C presents the results based on the four-factor model abnormal returns. Parameters for all models are estimated over a 250-day estimation window. Statistical significance of CAARs is assessed using the parametric test described in **section 4.5.5**. Statistical significance is indicated by ***, **, and * at the 1%, 5% and 10% levels, respectively.

Appendix 13

Descriptive statistics for different event window CARs.

Panel A: Full Sample

Median			S.D			Min			Max			Kurt			Skew		
(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
0.09%	0.08%	0.17%	0.014	0.014	0.013	-3.27%	-3.39%	-2.83%	4.69%	4.75%	4.23%	2.146	2.331	1.046	0.968	0.981	0.701
0.12%	0.25%	0.37%	0.022	0.021	0.019	-2.83%	-3.68%	-3.34%	7.81%	7.62%	7.92%	0.686	1.122	1.852	0.887	0.904	1.001
0.15%	0.17%	0.25%	0.017	0.017	0.016	-3.51%	-2.67%	-4.37%	5.58%	5.79%	4.53%	0.148	0.265	0.386	0.582	0.666	0.280
0.15%	0.06%	0.35%	0.019	0.018	0.017	-3.71%	-4.50%	-4.26%	8.27%	8.28%	7.62%	2.872	3.067	3.418	1.444	1.233	1.129

Panel B: Non-USA banks

Median			S.D			Min			Max			Kurt			Skew		
(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
0.21%	0.27%	0.10%	0.012	0.012	0.013	-3.27%	-3.39%	-2.83%	3.36%	3.32%	3.97%	1.953	1.442	0.516	0.057	-0.233	0.462
0.09%	0.34%	0.51%	0.022	0.020	0.022	-2.83%	-3.68%	-3.34%	7.81%	7.54%	7.53%	0.956	1.676	0.908	0.939	0.810	0.749
0.29%	0.19%	0.33%	0.016	0.015	0.017	-2.39%	-2.56%	-3.56%	4.68%	4.56%	4.48%	0.020	-0.191	-0.021	0.456	0.420	0.248
0.21%	0.18%	0.58%	0.019	0.017	0.019	-3.71%	-4.50%	-4.26%	7.17%	6.71%	6.85%	3.240	3.017	1.845	1.520	0.780	0.684

Panel C: USA banks

Median			S.D			Min			Max			Kurt			Skew		
(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
-0.02%	-0.05%	0.17%	0.015	0.015	0.012	-2.66%	-2.19%	-2.63%	4.69%	4.75%	4.23%	1.932	2.437	1.668	1.253	1.439	0.943
0.15%	0.16%	0.27%	0.022	0.022	0.017	-2.81%	-2.88%	-2.86%	7.54%	7.62%	7.92%	0.580	0.903	3.222	0.859	0.967	1.266
0.09%	0.07%	0.18%	0.018	0.018	0.015	-3.51%	-2.67%	-4.37%	5.58%	5.79%	4.53%	0.227	0.487	0.897	0.673	0.812	0.290
0.09%	0.00%	0.31%	0.019	0.019	0.015	-2.48%	-2.43%	-1.76%	8.27%	8.28%	7.62%	2.856	3.143	6.085	1.413	1.498	1.816

This table presents descriptive statistics on individual financial penalties, aggregate financial penalties and for all variables used in the cross-sectional regression analysis. Panel A has 141 observations. Panel B has 61 observations. Panel C has 80 observations. (1), (2) and (3) denote the market model, two-index model and four-factor model, respectively. The third row of each panel contains statistics for the window (0), the fourth for the window (-1,1), the fifth for the window (-1,0), and the sixth for the window (0,1). I report the median values, standard deviation values, minimum values, maximum values, and also kurtosis and skewness coefficients.

Appendix 14

Multivariate analysis of the effect of the entity imposing the penalty on the (-1, 1) market model CARs.

	Panel A: OLS Robust S.E.							**Panel B: WLS Robust S.E.**						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DOJ	-0.004							0.000						
FHFA		-0.013**							-0.012**					
JOINT			0.003							-0.002				
NYDFS				0.003							0.006			
OTHER					0.002							0.005		
PRIVATE						0.005							0.009*	
SEC							0.004							-0.001

This table presents the results of regressing the (-1, 1) market model CARs on a set of bank characteristics and agency type dummy variables. Panel A presents the results using as estimation method OLS with robust standard errors, while for panel B WLS with robust standard errors is used. Each model includes the dummy variable corresponding to the agency type of each event. Only agencies with more than 10 events constitute dummy variables, all the remaining agencies are included in the "Other" category. Whenever there is more than one settlement with different agencies in the same day for the same bank, the "Joint" category is applied. Model (1) considers settlements agreed with the U.S. Department of Justice. Model (2) considers settlements reached with the Federal Housing Finance Agency. Model (3) considers settlements reached with several entities. Model (4) considers settlements reached with the New York Department of Financial Services. Model (5) considers settlements with other agencies (see **Appendix 5**). Model (6) considers settlements reached with private parties. Model (7) considers settlements with the Securities and Exchange Commission. All variables from the baseline regression are included in all models, including dummy variables that control for the year of each observation. Statistical significance is indicated by ***, **, and * at the 1%, 5% and 10% levels, respectively.

Appendix 15

Multivariate analysis of the effect of the entity imposing the penalty on the (-1, 1) two-index model CARs.

	Panel A: OLS Robust S.E.							**Panel B: WLS Robust S.E.**						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DOJ	-0.003							0.001						
FHFA		-0.014**							-0.013***					
JOINT			0.002							-0.001				
NYDFS				0.004							0.005			
OTHER					0.003							0.004		
PRIVATE						0.003							0.009**	
SEC							0.004							-0.002

This table presents the results of regressing the (-1, 1) two-index model CARs on a set of bank characteristics and agency type dummy variables. Panel A presents the results using as estimation method OLS with robust standard errors, while for panel B WLS with robust standard errors is used. Each model includes the dummy variable corresponding to the agency type of each event. Only agencies with more than 10 events constitute dummy variables, all the remaining agencies are included in the "Other" category. Whenever there is more than one settlement with different agencies in the same day for the same bank, the "Joint" category is applied. Model (1) considers settlements agreed with the U.S. Department of Justice. Model (2) considers settlements reached with the Federal Housing Finance Agency. Model (3) considers settlements reached with several entities. Model (4) considers settlements reached with the New York Department of Financial Services. Model (5) considers settlements with other agencies (see **Appendix 5**). Model (6) considers settlements reached with private parties. Model (7) considers settlements with the Securities and Exchange Commission. All variables from the baseline regression are included in all models, including dummy variables that control for the year of each observation. Statistical significance is indicated by ***, **, and * at the 1%, 5% and 10% levels, respectively.

Appendix 16

Multivariate analysis of the effect of the entity imposing the penalty on the (-1, 1) four-factor model CARs.

	Panel A: OLS Robust S.E.							**Panel B: WLS Robust S.E.**						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DOJ	-0.072							-0.004						
FHFA		-0.009**							-0.010***					
JOINT			0.000							-0.004				
NYDFS				0.011							0.013			
OTHER					0.003							0.005		
PRIVATE						0.013***							0.012***	
SEC							0.002							-0.001

This table presents the results of regressing the (-1, 1) four-factor model CARs on a set of bank characteristics and agency type dummy variables. Panel A presents the results using as estimation method OLS with robust standard errors, while for panel B WLS with robust standard errors is used. Each model includes the dummy variable corresponding to the agency type of each event. Only agencies with more than 10 events constitute dummy variables, all the remaining agencies are included in the "Other" category. Whenever there is more than one settlement with different agencies in the same day for the same bank, the "Joint" category is applied. Model (1) considers settlements agreed with the U.S. Department of Justice. Model (2) considers settlements reached with the Federal Housing Finance Agency. Model (3) considers settlements reached with several entities. Model (4) considers settlements reached with the New York Department of Financial Services. Model (5) considers settlements with other agencies (see **Appendix 5**). Model (6) considers settlements reached with private parties. Model (7) considers settlements with the Securities and Exchange Commission. All variables from the baseline regression are included in all models, including dummy variables that control for the year of each observation. Statistical significance is indicated by ***, **, and * at the 1%, 5% and 10% levels, respectively.

Appendix 17

Multivariate analysis of the effect of misconduct type on the (-1, 1) market model CARs.

	Panel A: OLS Robust S.E.								**Panel B: WLS Robust S.E.**							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
COMPV	-0.003								-0.001							
CIPV		-0.003								-0.004						
MARKM			0.006								0.005					
MISSP				-0.003								-0.002				
MORTA					0.009**								0.008**			
SANC						0.010								0.018*		
TAXO							-0.001								-0.005	
VAR								-0.008								-0.009

This table presents the results of regressing the (-1, 1) market model CARs on a set of bank characteristics and misconduct type dummy variables. Panel A presents the results using as estimation method OLS with robust standard errors, while for panel B WLS with robust standard errors is used. Each model includes the dummy variable corresponding to the misconduct type of each event. Only agencies with more than 10 events constitute dummy variables, all the remaining agencies are included in the "Other" category. Whenever there is more than one settlement with different categories in the same day for the same bank, the "Varied" category is applied. Model (1) considers misconduct categorized as "Compliance Violation". Model (2) considers misconduct categorized as "Consumer/Investor Protection Violation". Model (3) considers misconduct categorized as "Market Manipulation". Model (4) considers misconduct categorized as "Misseling Practices". Model (5) considers misconduct categorized as "Mortgage Abuses". Model (6) considers misconduct categorized as "Sanctions Violations". Model (7) considers misconduct categorized as "Tax Offences". Model (8) considers events with more than one misconduct type in the same day. All variables from the baseline regression are included in all models, including dummy variables that control for the year of each observation. Statistical significance is indicated by ***, **, and * at the 1%, 5% and 10% levels, respectively.

Appendix 18

Multivariate analysis of the effect of misconduct type on the (-1, 1) two-index model CARs.

	Panel A: OLS Robust S.E.								**Panel B: WLS Robust S.E.**							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
COMPV	-0.004								0.000							
CIPV		-0.001								-0.002						
MARKM			0.002								-0.001					
MISSP				-0.004								-0.002				
MORTA					0.010***								0.009***			
SANC						0.011								0.018*		
TAXO							-0.005								-0.007	
VAR								-0.004								-0.005

This table presents the results of regressing the (-1, 1) two-index model CARs on a set of bank characteristics and misconduct type dummy variables. Panel A presents the results using as estimation method OLS with robust standard errors, while for panel B WLS with robust standard errors is used. Each model includes the dummy variable corresponding to the misconduct type of each event. Only agencies with more than 10 events constitute dummy variables, all the remaining agencies are included in the "Other" category. Whenever there is more than one settlement with different categories in the same day for the same bank, the "Varied" category is applied. Model (1) considers misconduct categorized as "Compliance Violation". Model (2) considers misconduct categorized as "Consumer/Investor Protection Violation". Model (3) considers misconduct categorized as "Market Manipulation". Model (4) considers misconduct categorized as "Misseling Practices". Model (5) considers misconduct categorized as "Mortgage Abuses". Model (6) considers misconduct categorized as "Sanctions Violations". Model (7) considers misconduct categorized as "Tax Offences". Model (8) considers events with more than one misconduct type in the same day. All variables from the baseline regression are included in all models, including dummy variables that control for the year of each observation. Statistical significance is indicated by ***, **, and * at the 1%, 5% and 10% levels, respectively.

Appendix 19

Multivariate analysis of the effect of misconduct type on the (-1, 1) four-factor model CARs.

	Panel A: OLS Robust S.E.								**Panel B: WLS Robust S.E.**							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
COMPV	-0.001								0.002							
CIPV		-0.008								-0.004						
MARKM			0.001								0.001					
MISSP				0.001								-0.001				
MORTA					0.007								0.005			
SANC						0.014								0.022**		
TAXO							-0.011								-0.016	
VAR								-0.004								-0.007

This table presents the results of regressing the (-1, 1) four-factor model CARs on a set of bank characteristics and misconduct type dummy variables. Panel A presents the results using as estimation method OLS with robust standard errors, while for panel B WLS with robust standard errors is used. Each model includes the dummy variable corresponding to the misconduct type of each event. Only agencies with more than 10 events constitute dummy variables, all the remaining agencies are included in the "Other" category. Whenever there is more than one settlement with different categories in the same day for the same bank, the "Varied" category is applied. Model (1) considers misconduct categorized as "Compliance Violation". Model (2) considers misconduct categorized as "Consumer/Investor Protection Violation". Model (3) considers misconduct categorized as "Market Manipulation". Model (4) considers misconduct categorized as "Misseling Practices". Model (5) considers misconduct categorized as "Mortgage Abuses". Model (6) considers misconduct categorized as "Sanctions Violations". Model (7) considers misconduct categorized as "Tax Offences". Model (8) considers events with more than one misconduct type in the same day. All variables from the baseline regression are included in all models, including dummy variables that control for the year of each observation. Statistical significance is indicated by ***, **, and * at the 1%, 5% and 10% levels, respectively.

9. References

Agrawal, A., Jaffe, J. F., & Karpoff, J. M. (1999). Management turnover and governance changes following the revelation of fraud. *The Journal of Law and Economics*, 42(S1), 309-342.

Alexander, C. R. (1999). On the nature of the reputational penalty for corporate crime: Evidence. *The Journal of Law and Economics*, 42(S1), 489-526.

Asimakopoulos, I., & Athanasoglou, P. P. (2012). Revisiting the merger and acquisition performance of European banks. *International Review of Financial Analysis*, 29, 237-249.

Athanasoglou, P. P., Brissimis, S. N., & Delis, M. D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money*, 18(2), 121-136.

Ball, R., & Brown, P. (1968). An empirical evaluation of accounting income numbers. *Journal of Accounting Research*, 6(2), 159-178.

Bank for International Settlements. (2009). *Enhancements to the Basel II framework*. Basel, Switzerland: Bank for International Settlements. Retrieved from https://www.bis.org/publ/bcbs157.pdf

Berger, A. N. (1995). The relationship between capital and earnings in banking. *Journal of Money, Credit and Banking*, 27(2), 432-456.

Bernard, V. L. (1987). Cross-sectional dependence and problems in inference in market-based accounting research. *Journal of Accounting Research*, 25(1) 1-48.

Bhagat, S., Brickley, J. A., & Coles, J. L. (1994). The costs of inefficient bargaining and financial distress: Evidence from corporate lawsuits. *Journal of Financial Economics*, 35(2), 221-247.

Binder, J. (1998). The event study methodology since 1969. *Review of quantitative Finance and Accounting*, 11(2), 111-137.

Boehmer, E., Masumeci, J., & Poulsen, A. B. (1991). Event-study methodology under conditions of event-induced variance. *Journal of Financial Economics*, 30(2), 253-272.

Brown, S. J., & Warner, J. B. (1980). Measuring security price performance. *Journal of Financial Economics*, 8(3), 205-258.

Brown, S. J., & Warner, J. B. (1985). Using daily stock returns: The case of event studies. *Journal of Financial Economics*, 14(1), 3-31.

Campbell, C. J., & Wesley, C. E. (1993). Measuring security price performance using daily NASDAQ returns. *Journal of Financial Economics*, 33(1), 73-92.

Carhart, M. M. (1997). On persistence in mutual fund performance. *The Journal of Finance*, 52(1), 57-82.

Carletti, E. (2017). *Fines for misconduct in the banking sector – what is the situation in the EU?*. Brussels, Belgium: European Parliament. Retrieved from http://www.europarl.europa.eu/RegData/etudes/IDAN/2017/587402/IPOL_IDA(2017)587402_EN.pdf

Collins, D. W., & Dent, W. T. (1984). A comparison of alternative testing methodologies used in capital market research. *Journal of Accounting Research*, 22(1) 48-84.

Corrado, C. J. (1989). A nonparametric test for abnormal security-price performance in event studies. *Journal of Financial Economics*, 23(2), 385-395.

Cowan, A. R. (1992). Nonparametric event study tests. *Review of Quantitative Finance and Accounting*, 2(4), 343-358.

Cummins, J. D., Lewis, C. M., & Wei, R. (2006). The market value impact of operational loss events for US banks and insurers. *Journal of Banking & Finance*, 30(10), 2605-2634.

De Fontnouvelle, P., & Perry, J. (2005). *Measuring reputational risk: The market reaction to operational loss announcements*. Federal Reserve Bank of Boston

Demirgüç-Kunt, A., & Huizinga, H. (1999). Determinants of commercial bank interest margins and profitability: some international evidence. *The World Bank Economic Review*, 13(2), 379-408.

European Banking Authority. (2016). *EU-wide Stress Test: Methodological Note*. London, United Kingdom: European Banking Authority. Retrieved from https://www.eba.europa.eu/documents/10180/1259315/2016+EU-wide+stress+test-Methodological+note.pdf

European Systemic Risk Board. (2015). *Report on misconduct risk in the banking sector*. Frankfurt am Main, Germany: European Systemic Risk Board. Retrieved from https://www.esrb.europa.eu/pub/pdf/other/150625_report_misconduct_risk.en.pdf

Fama, E. F., Fisher, L., Jensen, M. C., & Roll, R. (1969). The adjustment of stock prices to new information. *International Economic Review*, 10(1), 1-21.

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33(1), 3-56.

Gillet, R., Hübner, G., & Plunus, S. (2010). Operational risk and reputation in the financial industry. *Journal of Banking & Finance*, 34(1), 224-235.

Gonedes, N. J., & Dopuch, N. (1974). Capital market equilibrium, information production, and selecting accounting techniques: Theoretical framework and review of empirical work. *Journal of Accounting Research*, 12, 48-129.

Haslem, B. (2005). Managerial opportunism during corporate litigation. *The Journal of Finance*, 60(4), 2013-2041.

Jaffe, J. F. (1974). Special information and insider trading. *The Journal of Business*, 47(3), 410-428.

Karafiath, I. (1994). On the efficiency of least squares regression with security abnormal returns as the dependent variable. *Journal of Financial and Quantitative Analysis*, 29(2), 279-300.

Karafiath, I. (2009). Is there a viable alternative to ordinary least squares regression when security abnormal returns are the dependent variable?. *Review of Quantitative Finance and Accounting*, 32(1), 17-31.

Karpoff, J. M., & Lott Jr, J. R. (1993). The reputational penalty firms bear from committing criminal fraud. *The Journal of Law and Economics*, 36(2), 757-802.

Karpoff, J. M., & Lott, Jr, J. R. (1999). On the determinants and importance of punitive damage awards. *The Journal of Law and Economics*, 42(S1), 527-573.

Kothari, S. P., & Warner, J. B. (2006). Econometrics of event studies. In B. Eckbo (Ed.), *Handbook of Corporate Finance: Empirical Corporate Finance*,1, 3-36.

Koku, P. S., & Qureshi, A. A. (2006). Analysis of the effects of settlement of interfirm lawsuits. *Managerial and Decision Economics*, 27(4), 307-318.

Köster, H., & Pelster, M. (2017). Financial penalties and bank performance. *Journal of Banking & Finance*, 79, 57-73.

MacKinlay, A. C. (1997). Event studies in economics and finance. *Journal of Economic Literature*, 35(1), 13-39.

Mikkelson, W. H., & Partch, M. M. (1988). Withdrawn security offerings. *Journal of Financial and Quantitative Analysis*, 23(2), 119-133.

Morgan, D. P., (2002). Rating banks: Risk and uncertainty in an opaque industry. *The American Economic Review*, 92(4), 874-888.

Murphy, D. L., Shrieves, R. E., & Tibbs, S. L. (2009). Understanding the penalties associated with corporate misconduct: An empirical examination of earnings and risk. *Journal of Financial and Quantitative Analysis*, 44(1), 55-83.

Patell, J. M. (1976). Corporate forecasts of earnings per share and stock price behavior: Empirical test. *Journal of Accounting Research*, 14(2), 246-276.

Reichert, A. K., Lockett, M., & Rao, R. P. (1996). The impact of illegal business practice on shareholder returns. *Financial Review*, 31(1), 67-85.

Resti, A. (2017). Fines for misconduct in the banking sector – what is the situation in the EU?. Brussels, Belgium: European Parliament. Retrieved from http://www.europarl.europa.eu/RegData/etudes/IDAN/2017/587400/IPOL_IDA(2017)587400_EN.pdf

Simpson, S. S. (2002). *Corporate crime, law, and social control*. New York, NY: Cambridge University Press.

Skantz, T. R., Cloninger, D. O., & Strickland, T. H. (1990). Price-Fixing and Shareholder Returns: An Empirical Study. *Financial Review*, 25(1), 153-163.

The Boston Consulting Group. (2017). Staying the course in banking. Boston, USA: The Boston Consulting Group. Retrieved from http://image-src.bcg.com/BCG_COM/BCG-Staying-the-Course-in-Banking-Mar-2017_tcm9-146794.pdf

White, H. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica: Journal of the Econometric Society*, 48(4), 817-838.